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CommScope Technologies, LLC

TEST REPORT

SCOPE OF WORK
Emissions Testing For Class II Permissive Change on Model RPM-A5A11-B02 in new host model RP5200

REPORT NUMBER
104601893BOX-011

ISSUE DATE
May 9, 2021

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May 25, 2021

PAGES
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DOCUMENT CONTROL NUMBER
Non-Specific Radio Report Shell Rev. December 2017

EMISSIONS TEST REPORT

(FULL COMPLIANCE)

Report Number: 104601893BOX-011
Project Number: G104601893

Report Issue Date: 05/09/2021
Report Revision Date: 05/25/2021

Model(s) Tested: RPM-A5A11-B02 in new host RP5200
Model(s) Partially Tested: None
Model(s) Not Tested but declared equivalent by the client: None

Standards: CFR47 FCC Part 24 (05/2021), Class II Permissive Change

Tested by:
Intertek Testing Services NA, Inc.
70 Codman Hill Road
Boxborough, MA 01719
USA

Client:
CommScope Technologies LLC
900 Chelmsford St.
Lowell, MA 01851
USA

Report prepared by

Vathana Ven / EMC Staff Engineer

Report reviewed by

Kouma Sinn / EMC Staff Engineer

Table of Contents

1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 4.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested **complies** with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

2 Test Summary

Section	Test full name	Result
3	Client Information	--
4	Description of Equipment Under Test and Variant Models	--
5	System Setup and Method	--
6	Maximum Peak Output Power and Human RF exposure CFR47 FCC Parts 2.1046 and 24.232(a-b)	Pass
7	Band Edge Compliance CFR47 FCC Parts 2.1051, 2.1053, and 24.238(a-b)	Pass
8	Frequency Stability Over Voltages CFR47 FCC Parts 2.1055 and 24.235	Pass
9	Transmitter Spurious Emissions CFR47 FCC Parts 2.1051, 2.1053, 2.1057 and 24.238(a-b)	Pass
10	Revision History	--

Note: This evaluation is for Class II Permissive Change based on the use of new host, model RP5200.

3 Client Information

This EUT was tested at the request of:

Client: CommScope Technologies LLC
900 Chelmsford St.
Lowell, MA 01851
USA

Contact: Mr. Kevin Craig
Telephone: (978) 250-2678
Fax: None
Email: kevin.craig@commscope.com

4 Description of Equipment Under Test and Variant Models

Manufacturer: CommScope Telecommunications (China) Ltd.
68 Su Hong Xi Lu, Suzhou Industrial Park.
Suzhou, Jiangsu, 215021, China

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Band 2 Radio Module	CommScope Technologies LLC	RPM-A5A11-B02	19513000008
Onecell Radio Point	CommScope Technologies LLC	RP5200	05321060064

Receive Date:	03/24/2021
Received Condition:	Good
Type:	Production

Description of Equipment Under Test (provided by client)
The Radio Module is band specific using the Analog devices RF Agile Transceiver IC, AD936x. The device combines an RF front end with a flexible mixed-signal baseband section and integrated frequency synthesizers providing a configurable digital interface to the processor. The Radio Module also contains a band specific front end, band specific antenna and required power rails. All power rails required are derived from the 12 VDC bus supplied by the Baseband card. The reference frequency for the radio IC is 38.4 MHz is derived from the from an OCXO which is disciplined from a 1588 reference clock. It supports bandwidths of 5, 10, 15, and 20 MHz with four modulations; TM1.1-QPSK, TM3.2-16QAM, TM3.1-64QAM, and TM3.1a-256QAM. The radio is fixed.

Description of Radio Host (provided by client)
The OneCell® RP5200 family is factory configurable with 2 – 4 Radios Modules mounted to a Baseband card. The same PCB's will be used in both indoor and outdoor version of the radio point. The device is fixed. The baseband card is the host for the modular radios. It contains a two ethernet PHY's with one supporting 100M/1G/2.5G/5G/10G ethernet and the other supporting 100M/1G. The main processor is Zylinx Ultrascale+ MPSoC with 2 GB DDR3 and 4 GB Flash memory. The baseband PCBA converts POE power to +12 VDC bus voltage require as input to the radio modules.

Equipment Under Test Power Configuration			
Rated Voltage	Rated Current	Rated Frequency	Number of Phases
48 VDC	0.960 mA per pair max	DC	N/A

Operating modes of the EUT:

No.	Descriptions of EUT Exercising
1	Pre-programmed to transmit at Low, Mid, and High channels at four different modulations, TM1.1-QPSK, TM3.2-16QAM, TM3.1-64QAM, and TM3.1a-256QAM.

Software used by the EUT:

No.	Descriptions of EUT Exercising
1	RP5200 Diagnostics Ver 1009

Radio/Receiver Characteristics	
Frequency Band(s)	1930-1990 MHz
Modulation Type(s)	TM1.1-QPSK, TM3.2-16QAM, TM3.1-64 QAM, TM3.1a-256QAM
Maximum Output Power (conducted):	22.85 dBm (Conducted)
Test Channels	Low, Middle, High Channels of 5 MHz, 10 MHz, 15 MHz, and 20 MHz Bandwidths, Single Channel operation only
Occupied Bandwidth	18.017 MHz (Worst-case)
MIMO Information (# of Transmit and Receive antenna ports)	2x2 MIMO using cross polarized antennas and uncorrelated data streams
Equipment Type	Module in a host
Antenna Type and Gain	Detachable Antenna: +4 dBi (as provided by the client. Intertek takes no responsibility for the accuracy of this information. Actual antenna gain will be determined at the time of licensing)

Variant Models:

The following variant models were not tested as part of this evaluation, but have been identified by the manufacturer as being electrically identical models, depopulated models, or with reasonable similarity to the model(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

None

5 System Setup and Method

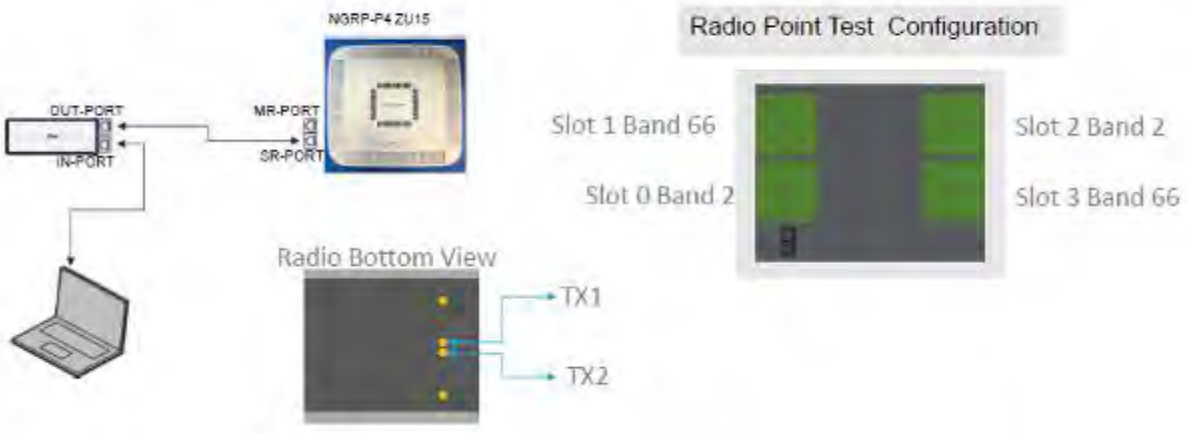
Cables					
ID	Description	Length (m)	Shielding	Ferrites	Termination
--	LAN (POE Power Cable)	2.58	Shielded	None	POE P/S
--	LAN (Communication)	9.00	Shielded	None	Laptop

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
Laptop	Dell	LATITUDE	None
Power Device Analzyer	Sifos Technologies	PDA-604A	604A0033

5.1 Method:

Configuration as required by ANSI C63.26-2015, KDB 662911, and CFR47 FCC Part 24 (05/2021).

5.2 EUT Block Diagram:



6 Maximum Peak Output Power and Human RF exposure

6.1 Method

Tests are performed in accordance with CFR47 FCC Parts 2.1046 and 24, KDB662911, and ANSI C63.26 Section 5.2.4.4.

TEST SITE: EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 400, and 480 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

6.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
CEN001'	DC-40GHz attenuator 20dB	Centric RF	C411-20	CEN001	02/22/2021	01/22/2022
CBLHF2012-2M-2	2m 9kHz-40GHz Coaxial Cable - SET1	Huber & Suhner	SF102	252676002	02/19/2021	02/19/2022
ROS005-1'	Signal and Spectrum Analyzer	Rohde & Schwarz	FSW43	100646	10/27/2020	10/27/2021
DAV005	Weather Station Vantage Vue	Davis	6250	MS191218083	02/07/2021	02/07/2022

Software Utilized:

Name	Manufacturer	Version
None	--	--

6.3 Results:

The maximum conducted output power was measured to be 22.85 dBm, which is much less than the EIRP limit of 24.232(a-b). The sample tested was found to Comply. Antenna gain limitations will depend on geographical locations and Height Above Average Terrain (HAAT). Output power from the two antenna ports was not summed since the data streams are uncorrelated and the antennas are cross polarized.

§24.232(a-b):

(a)(1) Base stations with an emission bandwidth of 1 MHz or less are limited to 1640 watts equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b) below.

(2) Base stations with an emission bandwidth greater than 1 MHz are limited to 1640 watts/MHz equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b) below.

(3) Base station antenna heights may exceed 300 meters HAAT with a corresponding reduction in power; *see*Tables 1 and 2 of this section.

(4) The service area boundary limit and microwave protection criteria specified in §§24.236 and 24.237 apply.

TABLE 1—REDUCED POWER FOR BASE STATION ANTENNA HEIGHTS OVER 300 METERS, WITH EMISSION BANDWIDTH OF 1 MHZ OR LESS

HAAT in meters	Maximum EIRP watts
≤300	1640
≤500	1070
≤1000	490
≤1500	270
≤2000	160

TABLE 2—REDUCED POWER FOR BASE STATION ANTENNA HEIGHTS OVER 300 METERS, WITH EMISSION BANDWIDTH GREATER THAN 1 MHZ

HAAT in meters	Maximum EIRP watts/MHz
≤300	1640
≤500	1070
≤1000	490
≤1500	270
≤2000	160

(b)(1) Base stations that are located in counties with population densities of 100 persons or fewer per square mile, based upon the most recently available population statistics from the Bureau of the Census, with an emission bandwidth of 1 MHz or less are limited to 3280 watts equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT.

(2) Base stations that are located in counties with population densities of 100 persons or fewer per square mile, based upon the most recently available population statistics from the Bureau of the Census, with an emission bandwidth greater than 1 MHz are limited to 3280 watts/MHz equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT.

(3) Base station antenna heights may exceed 300 meters HAAT with a corresponding reduction in power; *see*Tables 3 and 4 of this section.

(4) The service area boundary limit and microwave protection criteria specified in §§24.236 and 24.237 apply.

(5) Operation under this paragraph (b) at power limits greater than permitted under paragraph (a) of this section must be coordinated in advance with all broadband PCS licensees authorized to operate on adjacent frequency blocks within 120 kilometers (75 miles) of the base station and is limited to base stations located more than 120 kilometers (75 miles) from the Canadian border and more than 75 kilometers (45 miles) from the Mexican border.

TABLE 3—REDUCED POWER FOR BASE STATION ANTENNA HEIGHTS OVER 300 METERS, WITH EMISSION BANDWIDTH OF 1 MHZ OR LESS

HAAT in meters	Maximum EIRP watts
≤300	3280
≤500	2140
≤1000	980
≤1500	540
≤2000	320

TABLE 4—REDUCED POWER FOR BASE STATION ANTENNA HEIGHTS OVER 300 METERS, WITH EMISSION BANDWIDTH GREATER THAN 1 MHZ

HAAT in meters	Maximum EIRP watts/MHz
≤300	3280
≤500	2140
≤1000	980
≤1500	540
≤2000	320

Slot 0 (Band 2), Bandwidth: 5 MHz, Modulation: TM1.1-QPSK

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)
Low	1932.50	ANT0	21.35
		ANT1	21.47
Mid	1960.00	ANT0	22.02
		ANT1	22.23
High	1987.50	ANT0	21.94
		ANT1	22.18

Slot 0 (Band 2), Bandwidth: 10 MHz, Modulation: TM1.1-QPSK

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)
Low	1935.00	ANT0	21.79
		ANT1	22.10
Mid	1960.00	ANT0	21.99
		ANT1	22.25
High	1985.00	ANT0	21.60
		ANT1	22.07

Slot 0 (Band 2), Bandwidth: 15 MHz, Modulation: TM1.1-QPSK

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)
Low	1937.50	ANT0	22.69
		ANT1	22.85
Mid	1960.00	ANT0	22.37
		ANT1	22.79
High	1982.50	ANT0	22.00
		ANT1	22.33

Slot 0 (Band 2), Bandwidth: 20 MHz, Modulation: TM1.1-QPSK

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)
Low	1940.00	ANT0	20.19
		ANT1	22.24
Mid	1960.00	ANT0	21.74
		ANT1	22.09
High	1980.00	ANT0	21.75
		ANT1	22.20

Slot 0 (Band 2), Bandwidth: 5 MHz, Modulation: TM3.2-16QAM

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)
Low	1932.50	ANT0	20.62
		ANT1	20.93
Mid	1960.00	ANT0	21.60
		ANT1	21.77
High	1987.50	ANT0	21.14
		ANT1	21.63

Slot 0 (Band 2), Bandwidth: 10 MHz, Modulation: TM3.2-16QAM

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)
Low	1935.00	ANT0	20.98
		ANT1	21.43
Mid	1960.00	ANT0	21.31
		ANT1	21.35
High	1985.00	ANT0	21.02
		ANT1	21.45

Slot 0 (Band 2), Bandwidth: 15 MHz, Modulation: TM3.2-16QAM

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)
Low	1937.50	ANT0	21.32
		ANT1	21.47
Mid	1960.00	ANT0	21.09
		ANT1	21.29
High	1982.50	ANT0	21.01
		ANT1	21.28

Slot 0 (Band 2), Bandwidth: 20 MHz, Modulation: TM3.2-16QAM

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)
Low	1940.00	ANT0	21.42
		ANT1	21.67
Mid	1960.00	ANT0	21.19
		ANT1	21.52
High	1980.00	ANT0	21.26
		ANT1	21.63

Slot 0 (Band 2), Bandwidth: 5 MHz, Modulation: TM3.1-64QAM

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)
Low	1932.50	ANT0	21.14
		ANT1	21.50
Mid	1960.00	ANT0	22.04
		ANT1	22.13
High	1987.50	ANT0	21.78
		ANT1	22.25

Slot 0 (Band 2), Bandwidth: 10 MHz, Modulation: TM3.1-64QAM

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)
Low	1935.00	ANT0	21.59
		ANT1	21.96
Mid	1960.00	ANT0	21.97
		ANT1	22.02
High	1985.00	ANT0	21.55
		ANT1	22.10

Slot 0 (Band 2), Bandwidth: 15 MHz, Modulation: TM3.1-64QAM

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)
Low	1937.50	ANT0	22.28
		ANT1	22.32
Mid	1960.00	ANT0	21.87
		ANT1	22.21
High	1982.50	ANT0	21.88
		ANT1	22.27

Slot 0 (Band 2), Bandwidth: 20 MHz, Modulation: TM3.1-64QAM

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)
Low	1940.00	ANT0	22.03
		ANT1	22.36
Mid	1960.00	ANT0	21.80
		ANT1	22.06
High	1980.00	ANT0	21.81
		ANT1	22.20

Slot 0 (Band 2), Bandwidth: 5 MHz, Modulation: TM3.1a-256QAM_

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)
Low	1932.50	ANT0	21.24
		ANT1	21.50
Mid	1960.00	ANT0	22.04
		ANT1	22.15
High	1987.50	ANT0	21.88
		ANT1	22.18

Slot 0 (Band 2), Bandwidth: 10 MHz, Modulation: TM3.1a-256QAM_

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)
Low	1935.00	ANT0	21.65
		ANT1	21.92
Mid	1960.00	ANT0	21.93
		ANT1	22.07
High	1985.00	ANT0	21.63
		ANT1	22.08

Slot 0 (Band 2), Bandwidth: 15 MHz, Modulation: TM3.1a-256QAM

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)
Low	1937.500	ANT0	22.23
		ANT1	22.17
Mid	1960.00	ANT0	21.82
		ANT1	22.19
High	1982.50	ANT0	21.80
		ANT1	22.15

Slot 0 (Band 2), Bandwidth: 20 MHz, Modulation: TM3.1a-256QAM

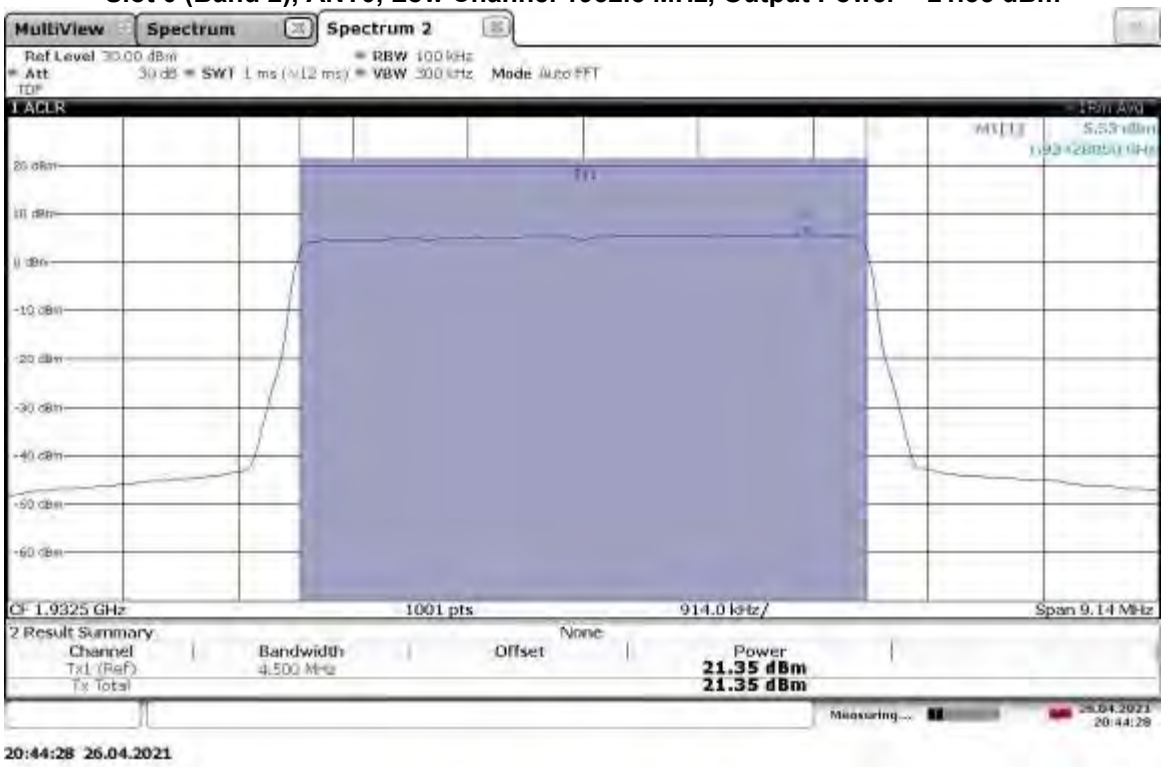
Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)
Low	1940	ANT0	22.03
		ANT1	22.30
Mid	1960	ANT0	21.72
		ANT1	22.03
High	1980	ANT0	21.81
		ANT1	21.76

6.4 Setup Photograph:

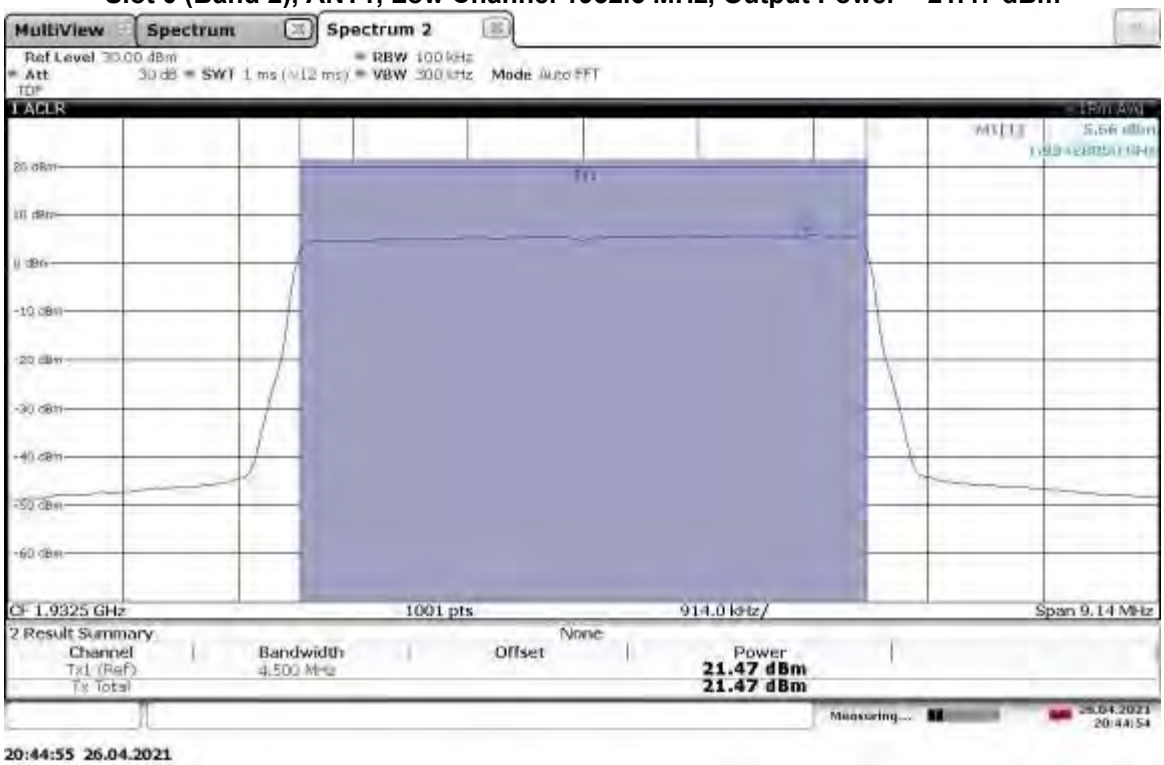
Confidential

6.5 Plots/Data:

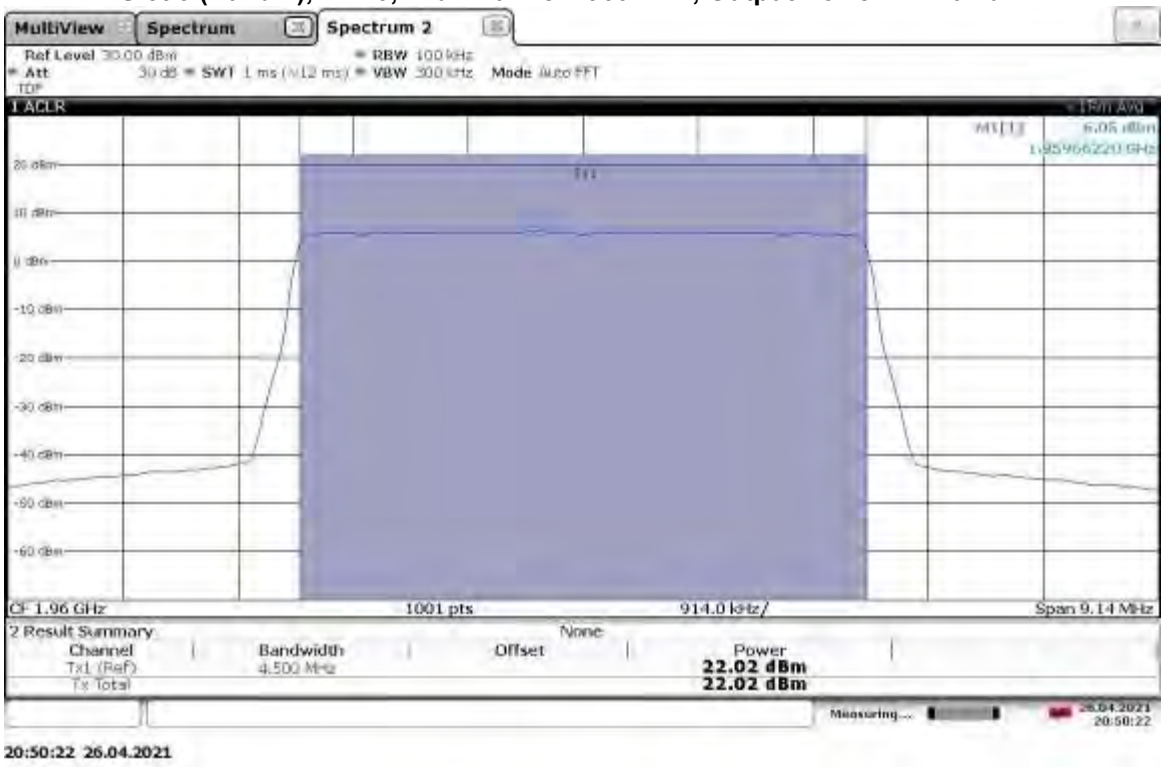
TM1.1-QPSK_5 MHz Bandwidth
Slot 0 (Band 2), ANT0, Low Channel 1932.5 MHz, Output Power = 21.35 dBm



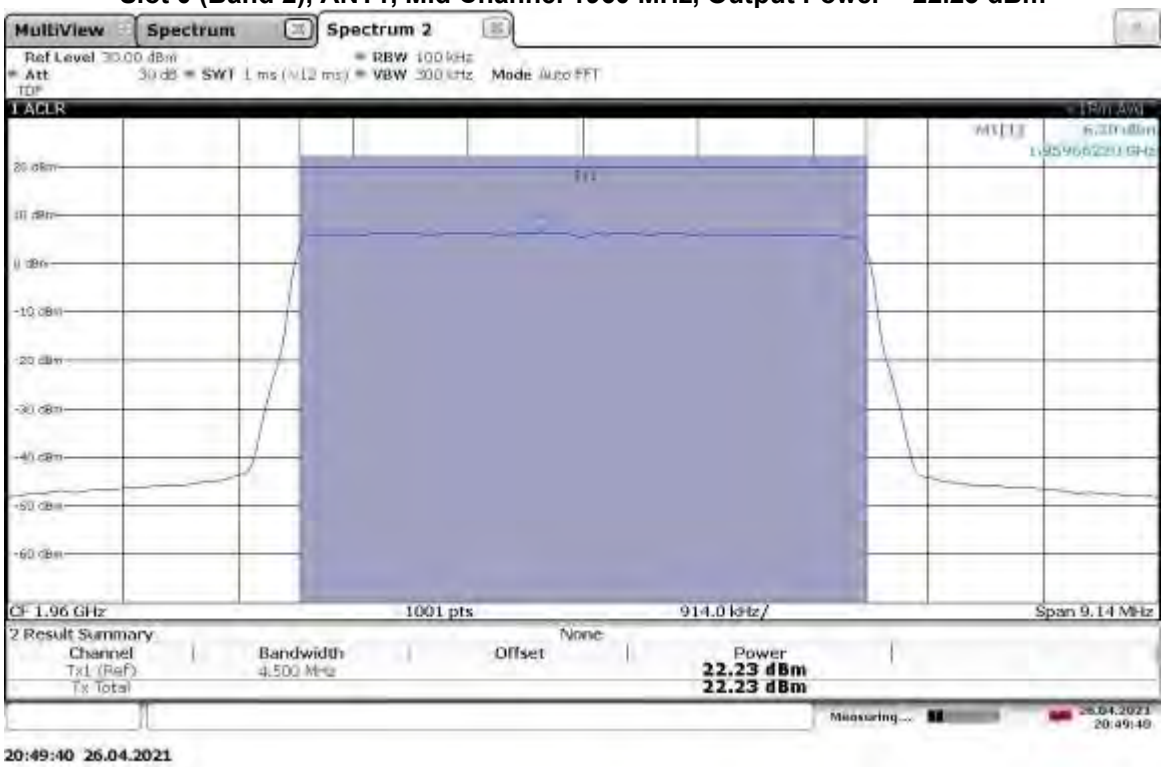
TM1.1-QPSK_5 MHz Bandwidth
Slot 0 (Band 2), ANT1, Low Channel 1932.5 MHz, Output Power = 21.47 dBm



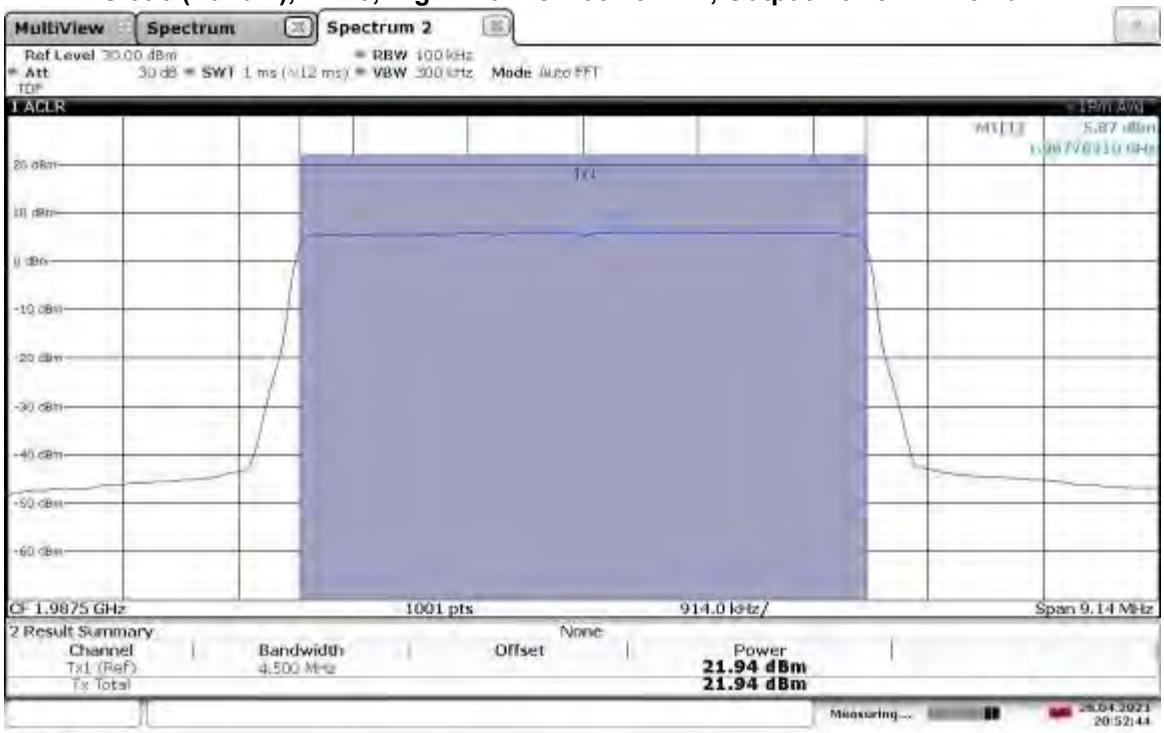
TM1.1-QPSK_5 MHz Bandwidth
Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, Output Power = 22.02 dBm



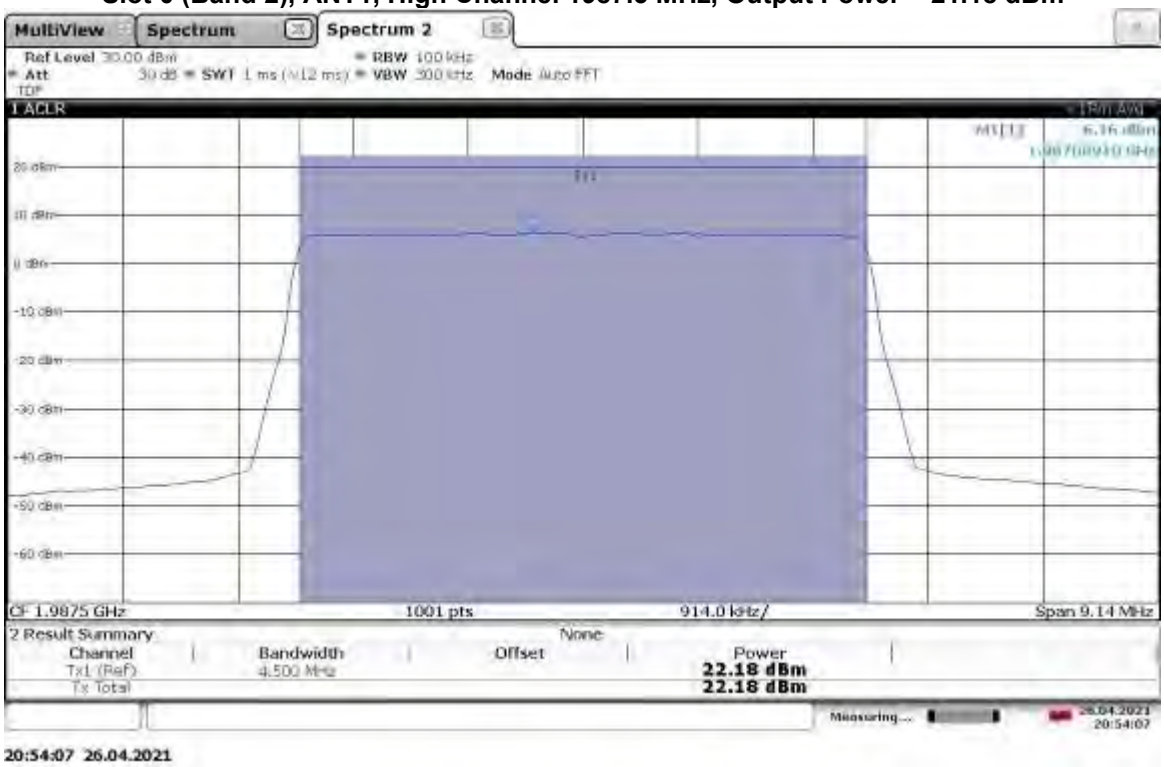
TM1.1-QPSK_5 MHz Bandwidth
Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 22.23 dBm



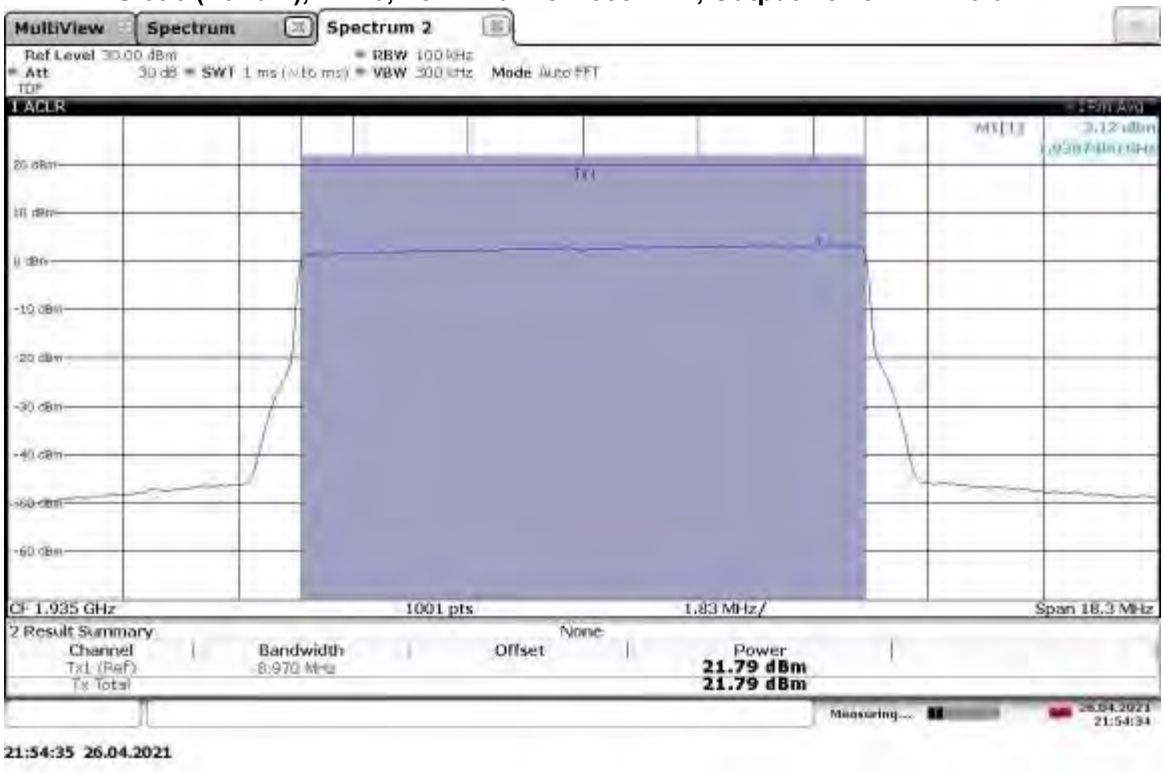
TM1.1-QPSK_5 MHz Bandwidth
Slot 0 (Band 2), ANT0, High Channel 1987.5 MHz, Output Power = 21.94 dBm



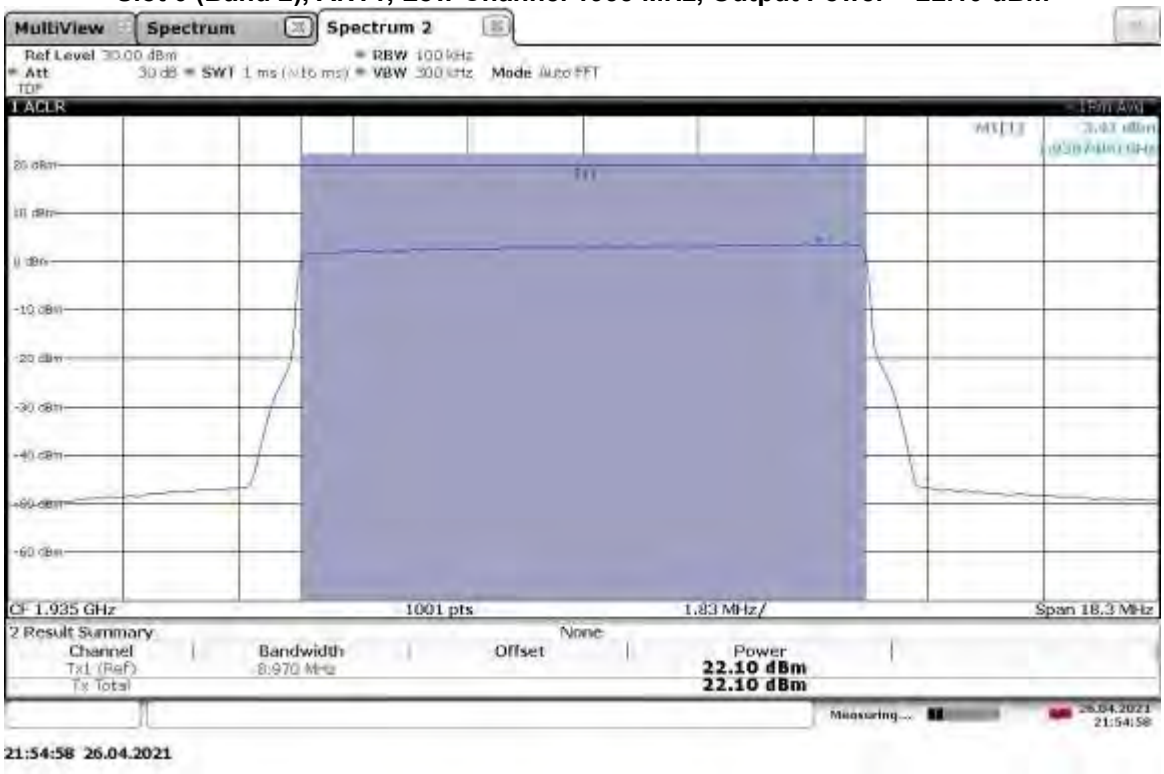
TM1.1-QPSK_5 MHz Bandwidth
Slot 0 (Band 2), ANT1, High Channel 1987.5 MHz, Output Power = 21.18 dBm



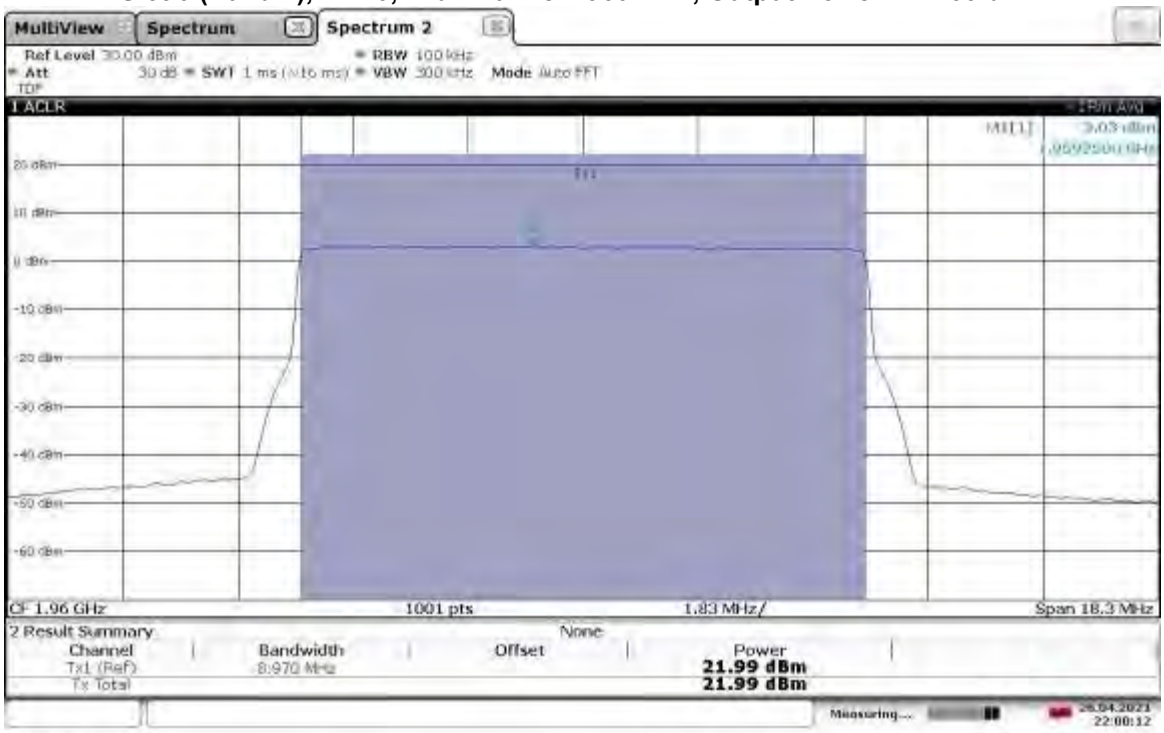
TM1.1-QPSK_10 MHz Bandwidth
Slot 0 (Band 2), ANT0, Low Channel 1935 MHz, Output Power = 21.79 dBm



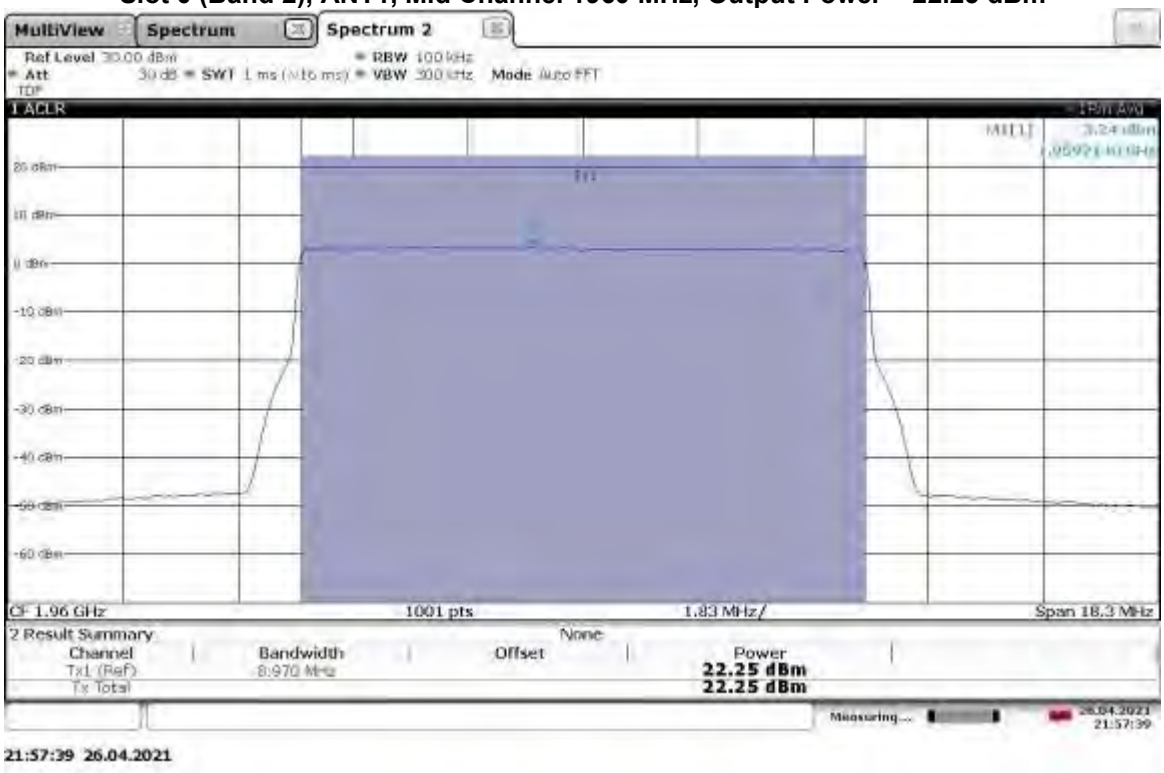
TM1.1-QPSK_10 MHz Bandwidth
Slot 0 (Band 2), ANT1, Low Channel 1935 MHz, Output Power = 22.10 dBm



TM1.1-QPSK_10 MHz Bandwidth
Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, Output Power = 21.99 dBm

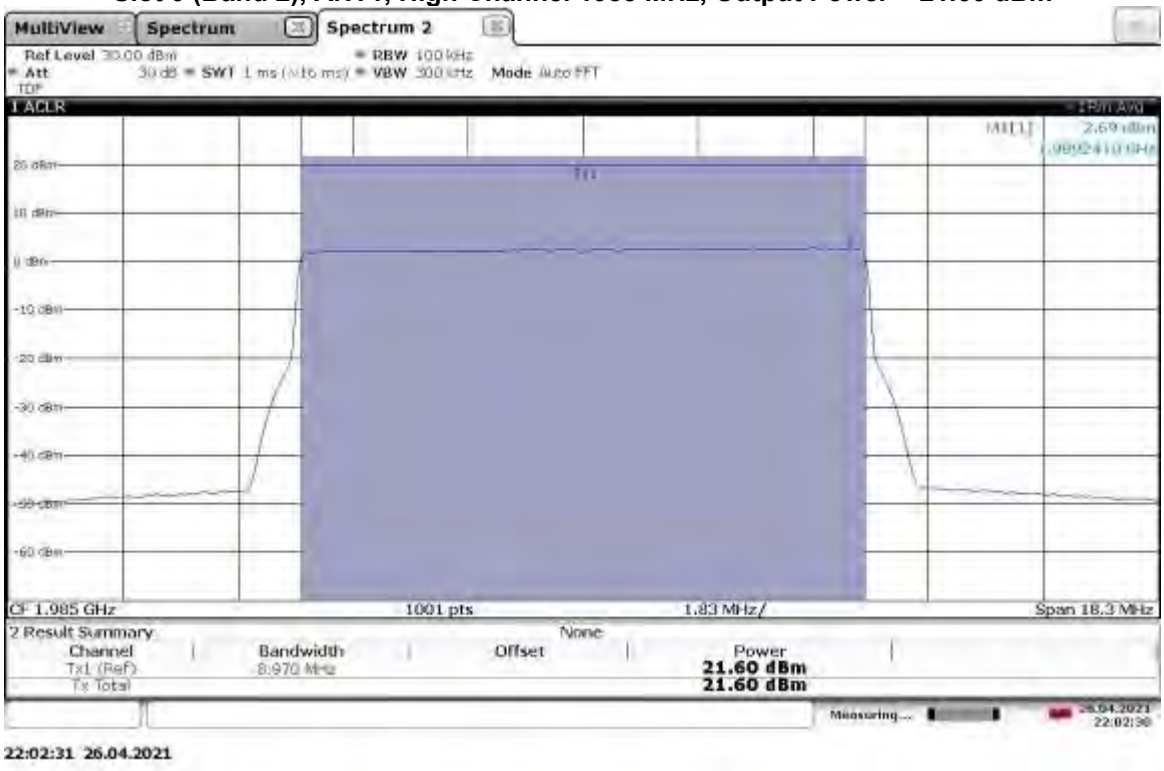


TM1.1-QPSK_10 MHz Bandwidth
Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 22.25 dBm

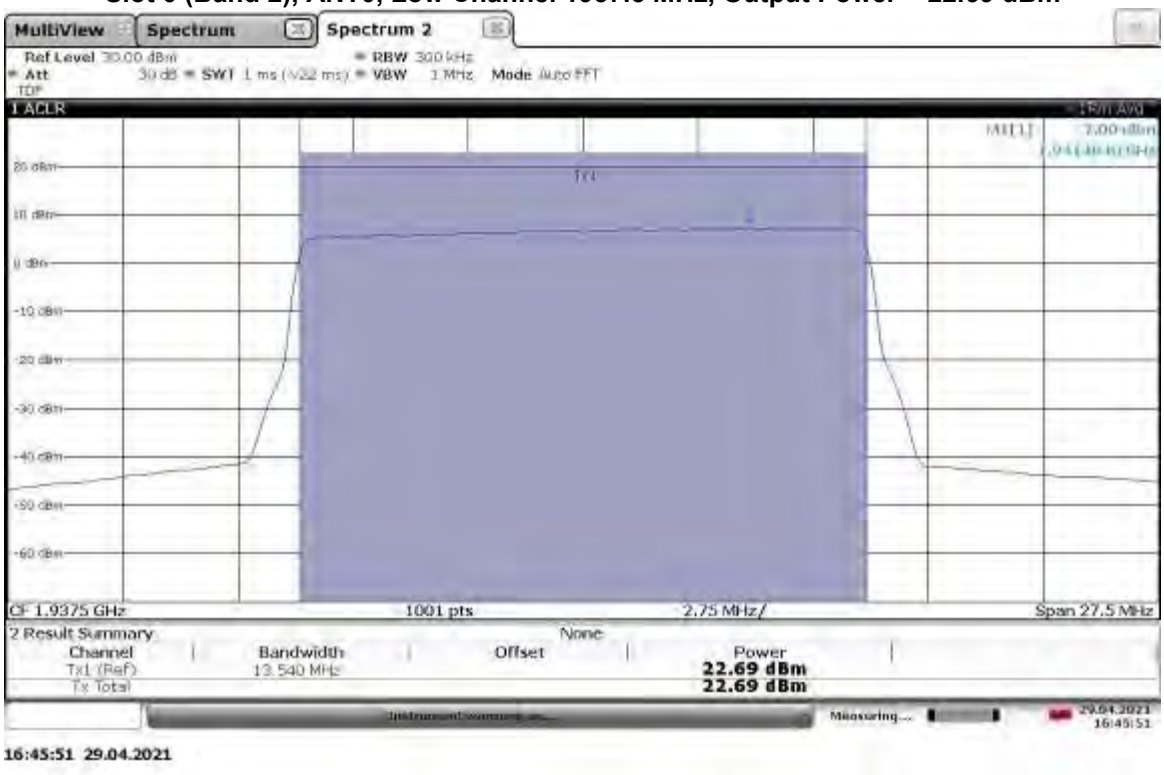


TM1.1-QPSK_10 MHz Bandwidth
Slot 0 (Band 2), ANT0, High Channel 1985 MHz, Output Power = 21.55 dBm

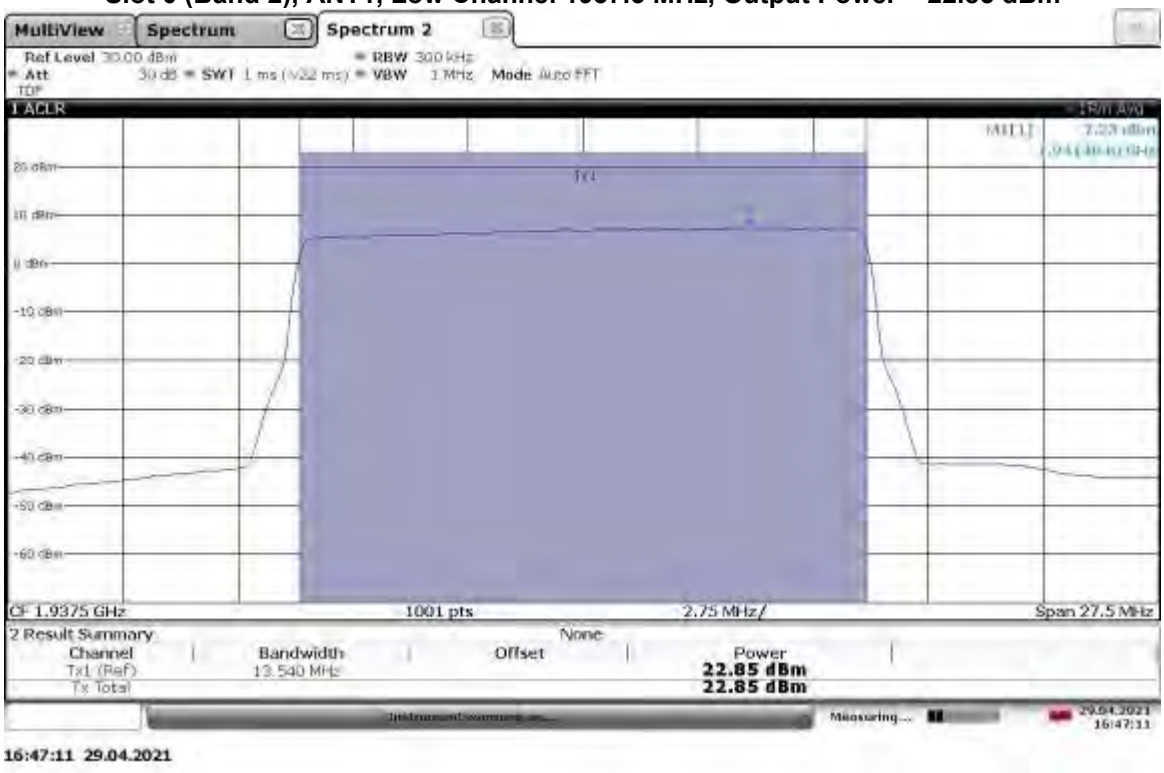
TM1.1-QPSK_10 MHz Bandwidth
Slot 0 (Band 2), ANT1, High Channel 1985 MHz, Output Power = 21.60 dBm



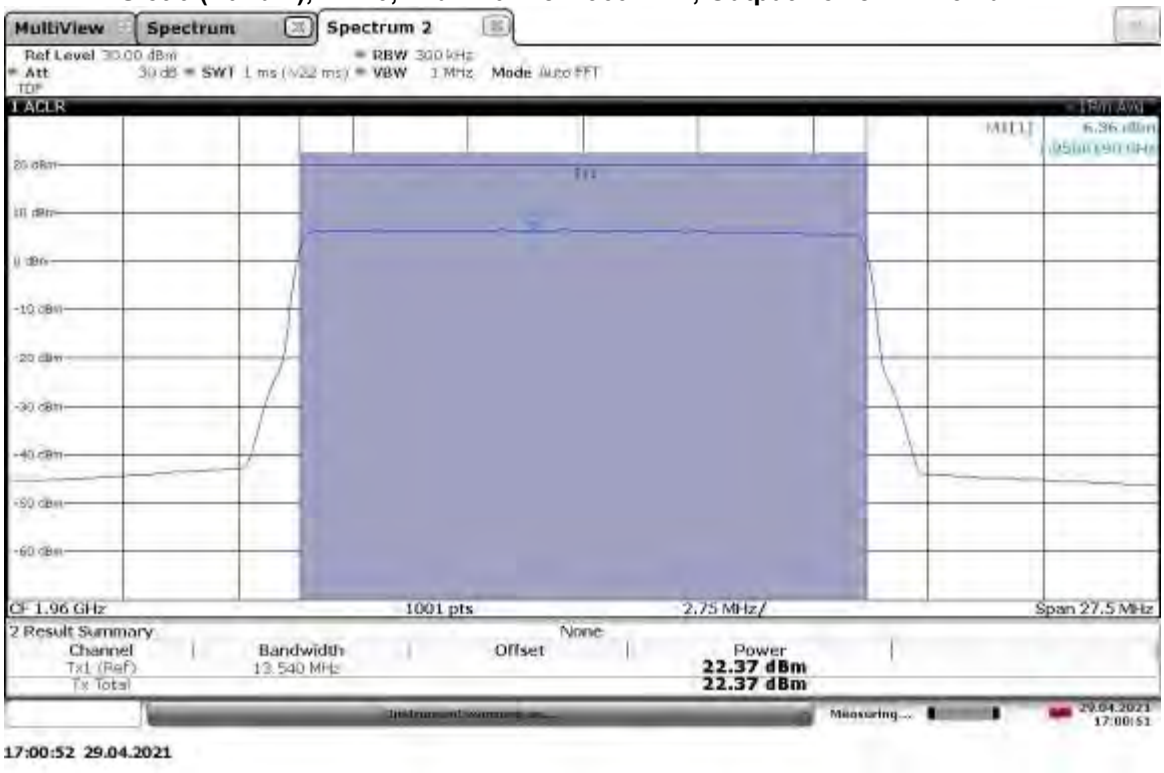
TM1.1-QPSK_15 MHz Bandwidth
Slot 0 (Band 2), ANT0, Low Channel 1937.5 MHz, Output Power = 22.69 dBm



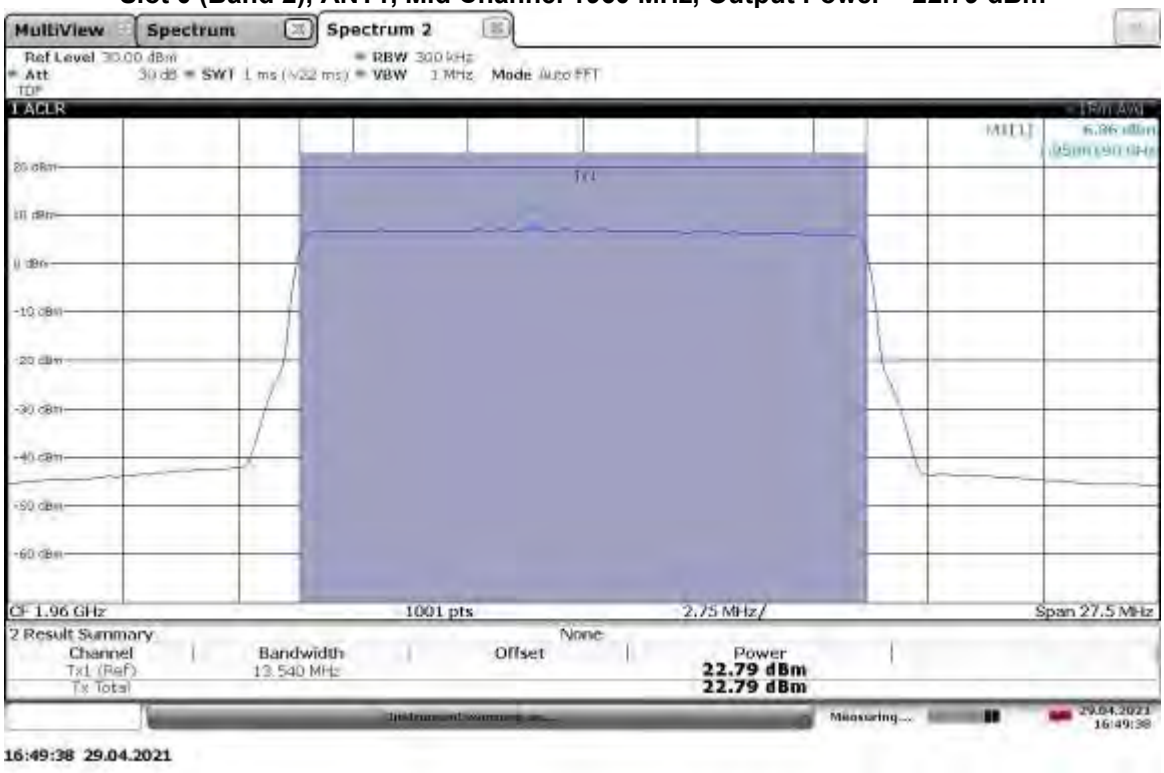
TM1.1-QPSK_15 MHz Bandwidth
Slot 0 (Band 2), ANT1, Low Channel 1937.5 MHz, Output Power = 22.85 dBm



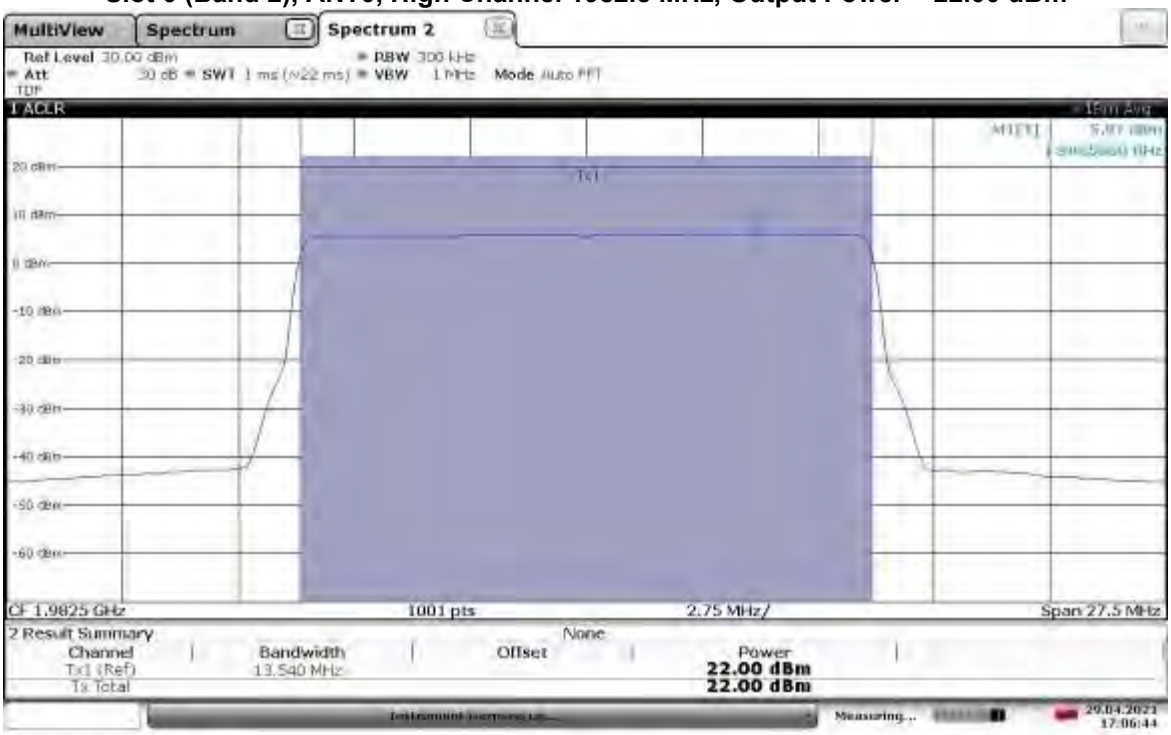
TM1.1-QPSK_15 MHz Bandwidth
Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, Output Power = 22.37 dBm



TM1.1-QPSK_15 MHz Bandwidth
Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 22.79 dBm

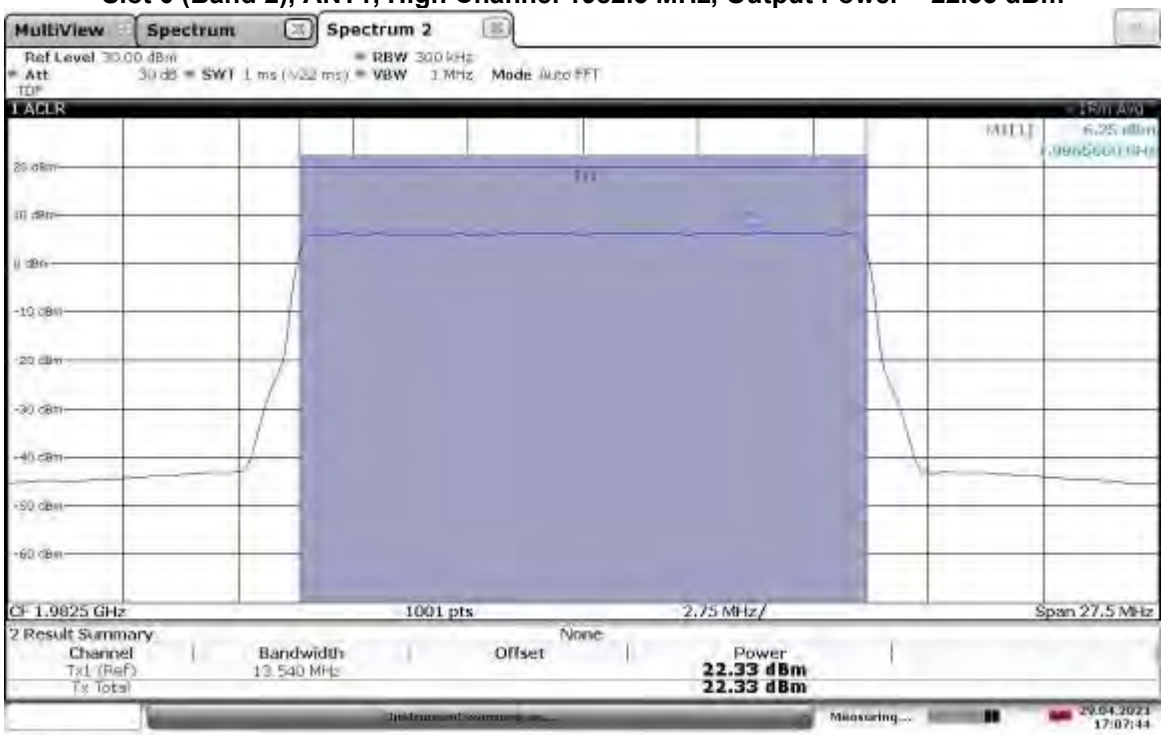


TM1.1-QPSK_15 MHz Bandwidth
Slot 0 (Band 2), ANT0, High Channel 1982.5 MHz, Output Power = 22.00 dBm



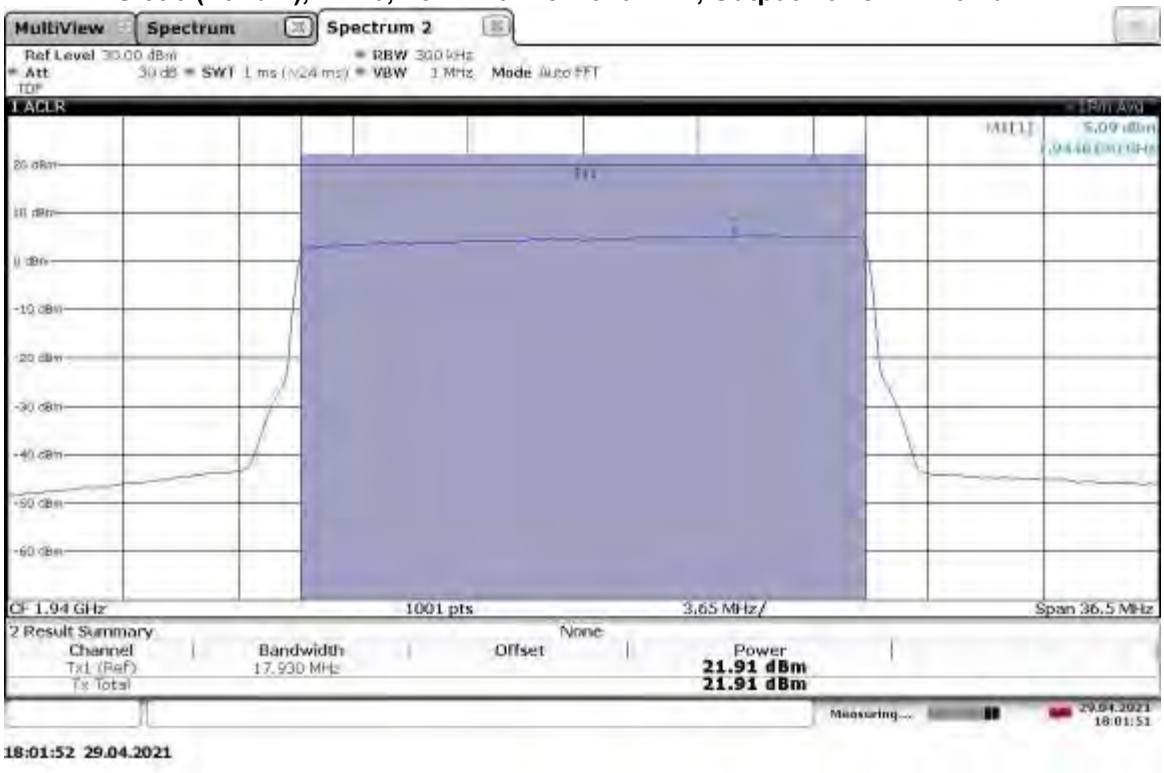
17:06:45 29.04.2021

TM1.1-QPSK_15 MHz Bandwidth
Slot 0 (Band 2), ANT1, High Channel 1982.5 MHz, Output Power = 22.33 dBm



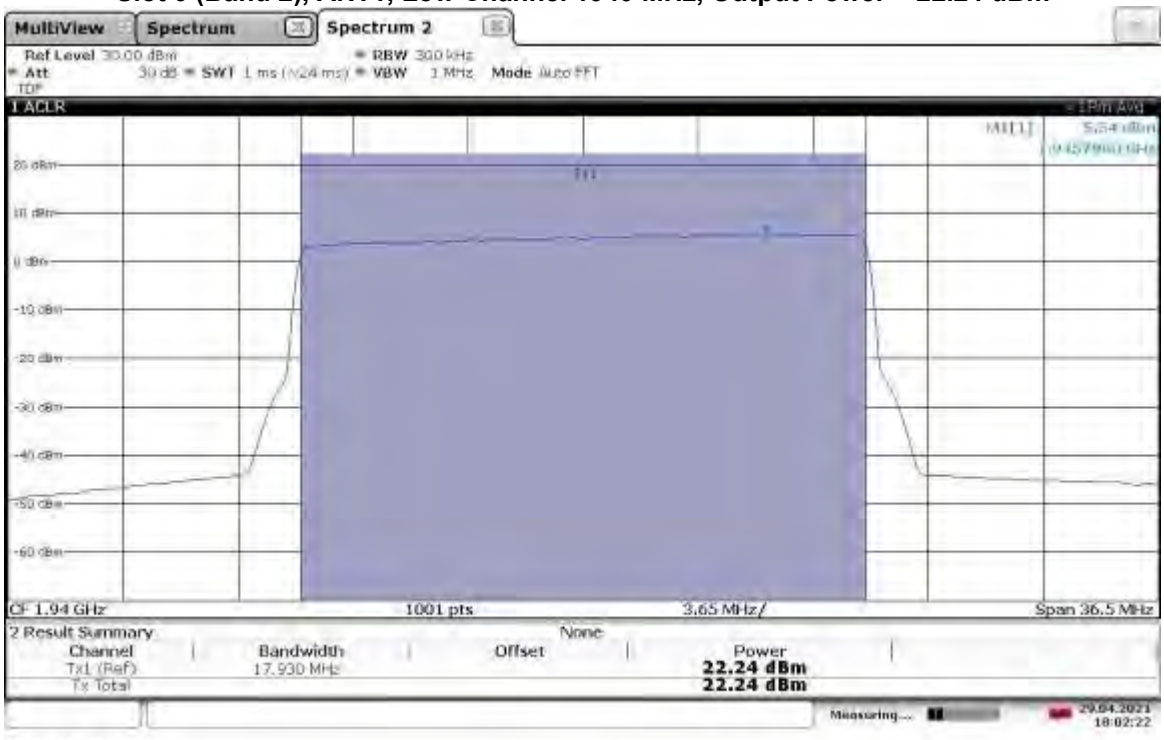
17:07:44 29.04.2021

TM1.1-QPSK_20 MHz Bandwidth
Slot 0 (Band 2), ANT0, Low Channel 1940 MHz, Output Power = 21.91 dBm



18:01:52 29.04.2021

TM1.1-QPSK_20 MHz Bandwidth
Slot 0 (Band 2), ANT1, Low Channel 1940 MHz, Output Power = 22.24 dBm



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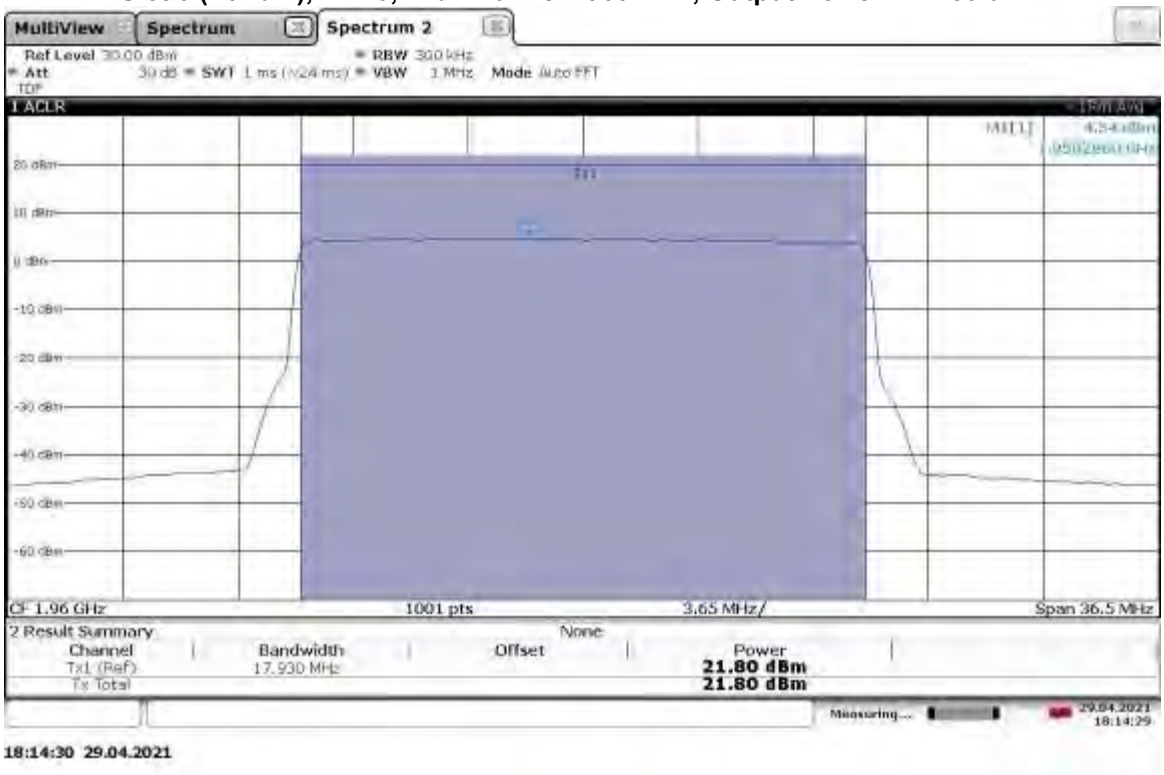
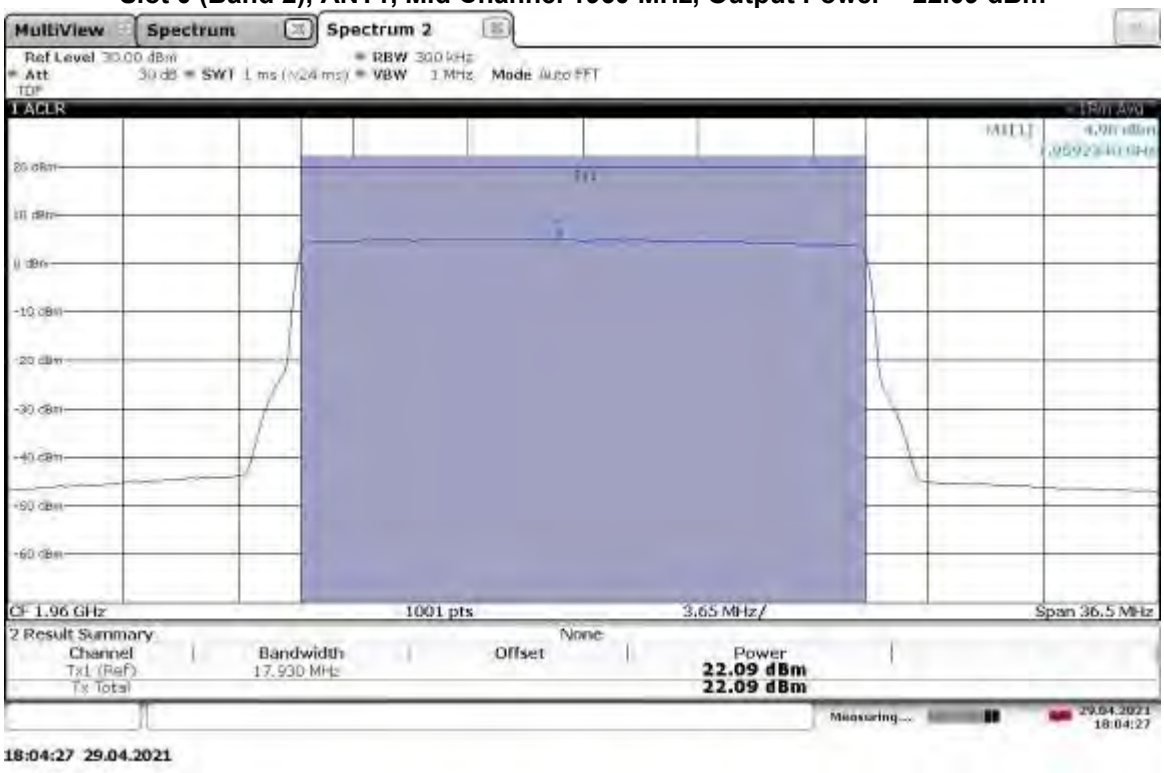
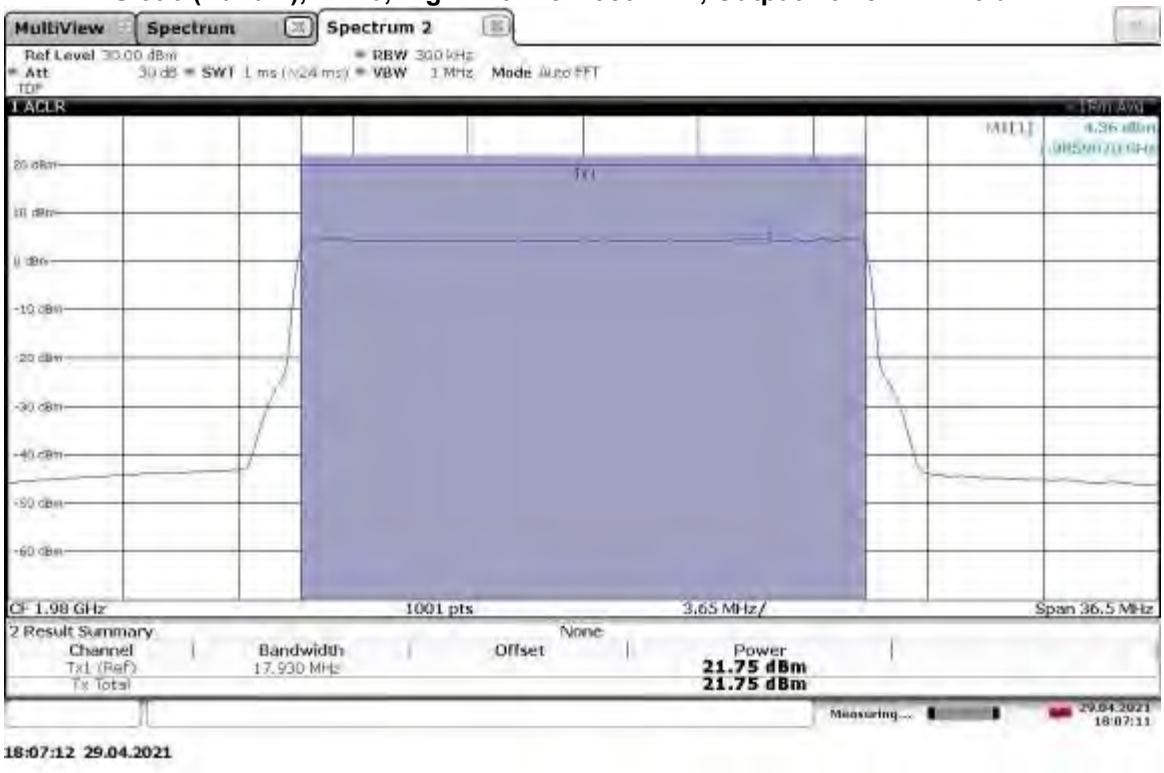
TM1.1-QPSK_20 MHz Bandwidth
Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, Output Power = 21.80 dBm



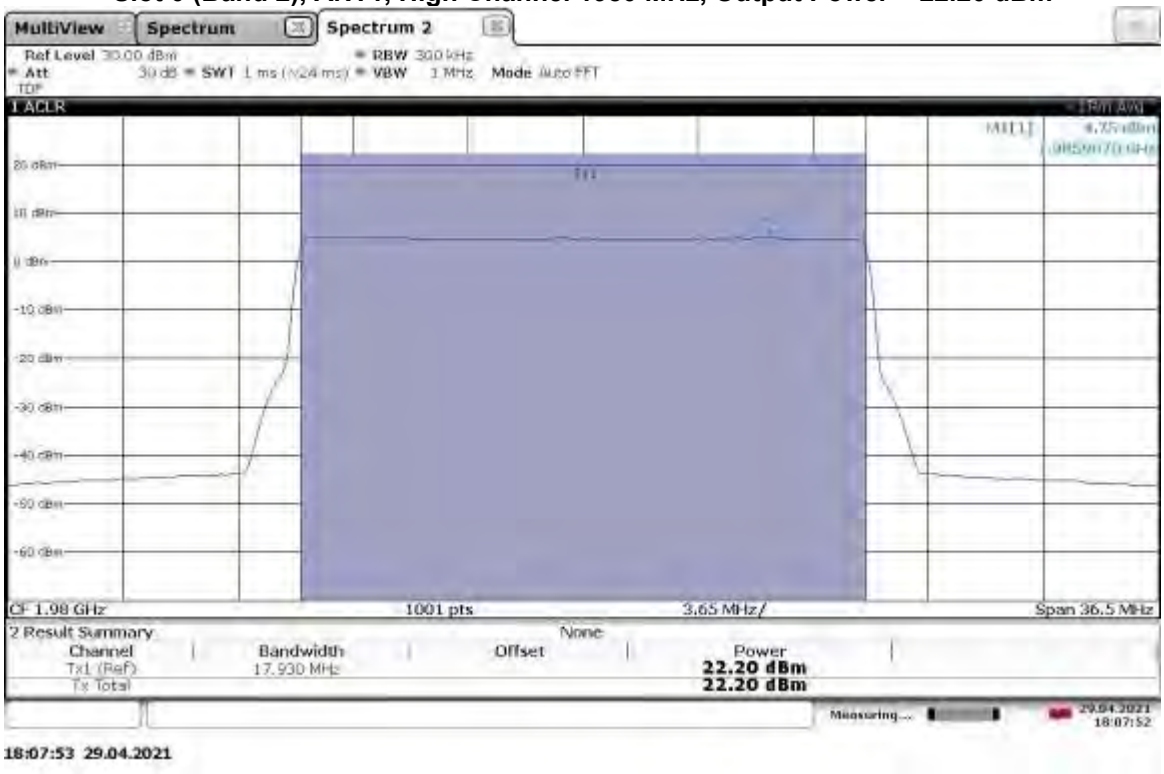
TM1.1-QPSK_20 MHz Bandwidth
Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 22.09 dBm



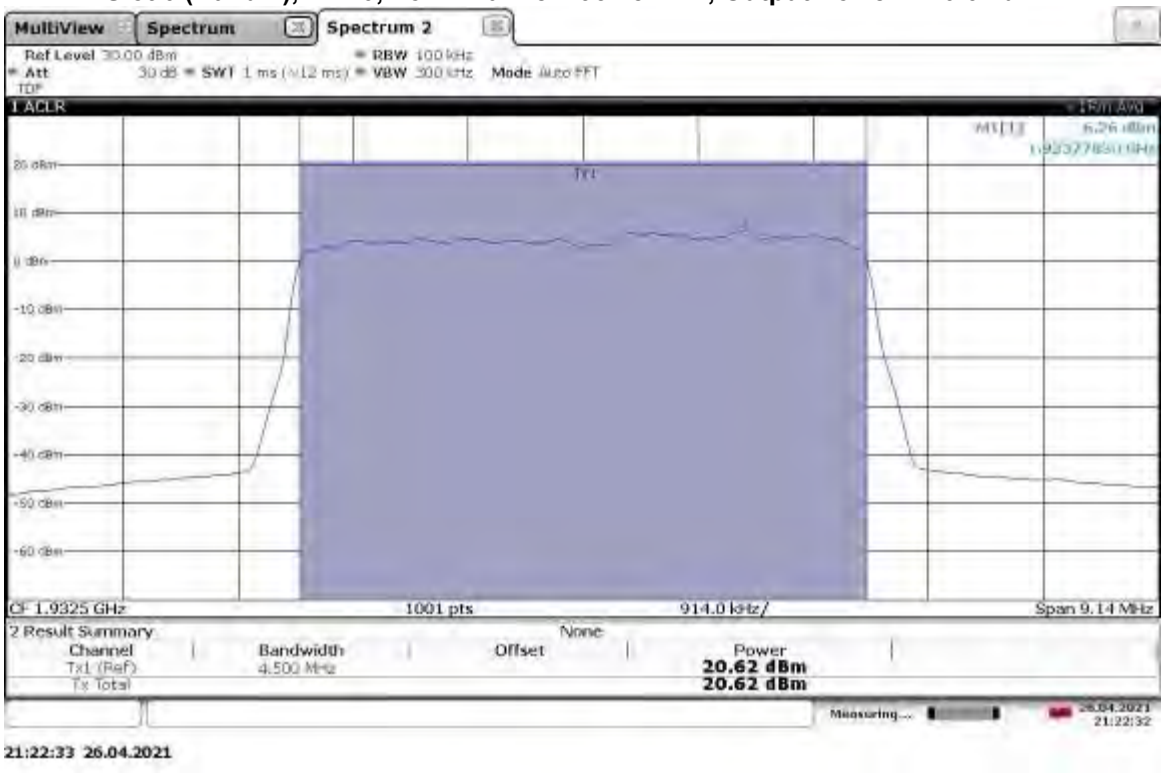
TM1.1-QPSK_20 MHz Bandwidth
Slot 0 (Band 2), ANT0, High Channel 1980 MHz, Output Power = 21.75 dBm



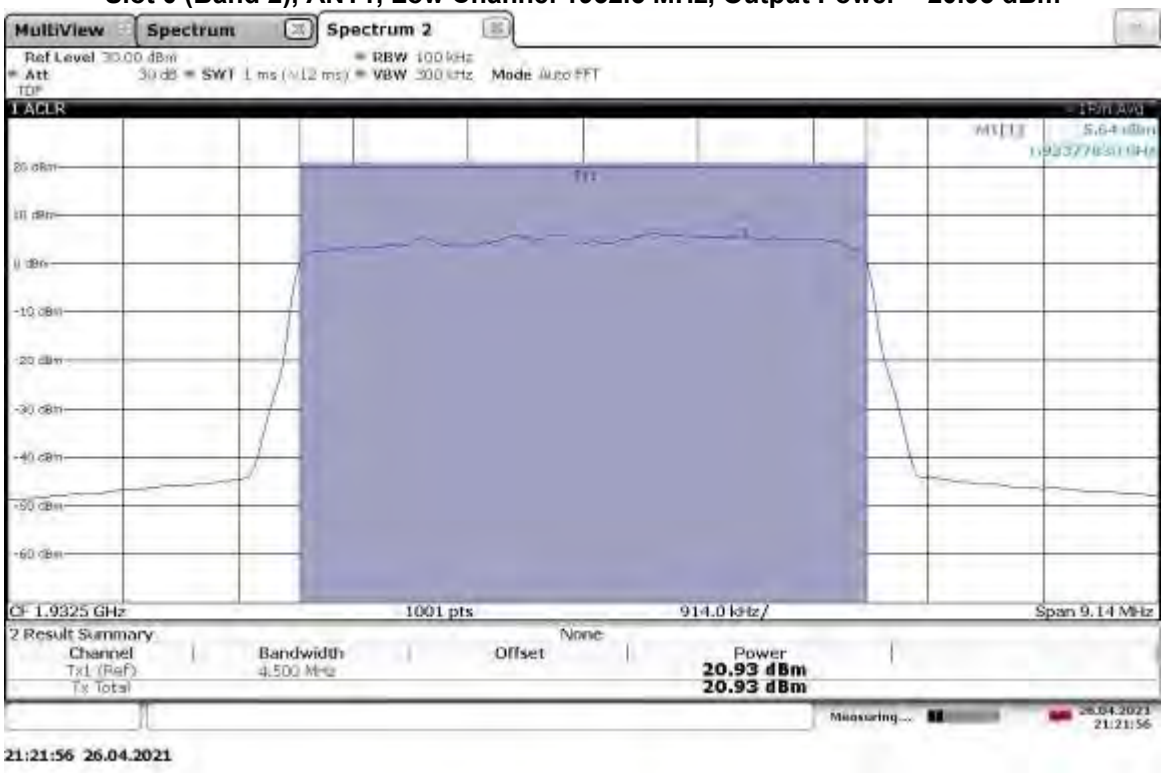
TM1.1-QPSK_20 MHz Bandwidth
Slot 0 (Band 2), ANT1, High Channel 1980 MHz, Output Power = 22.20 dBm



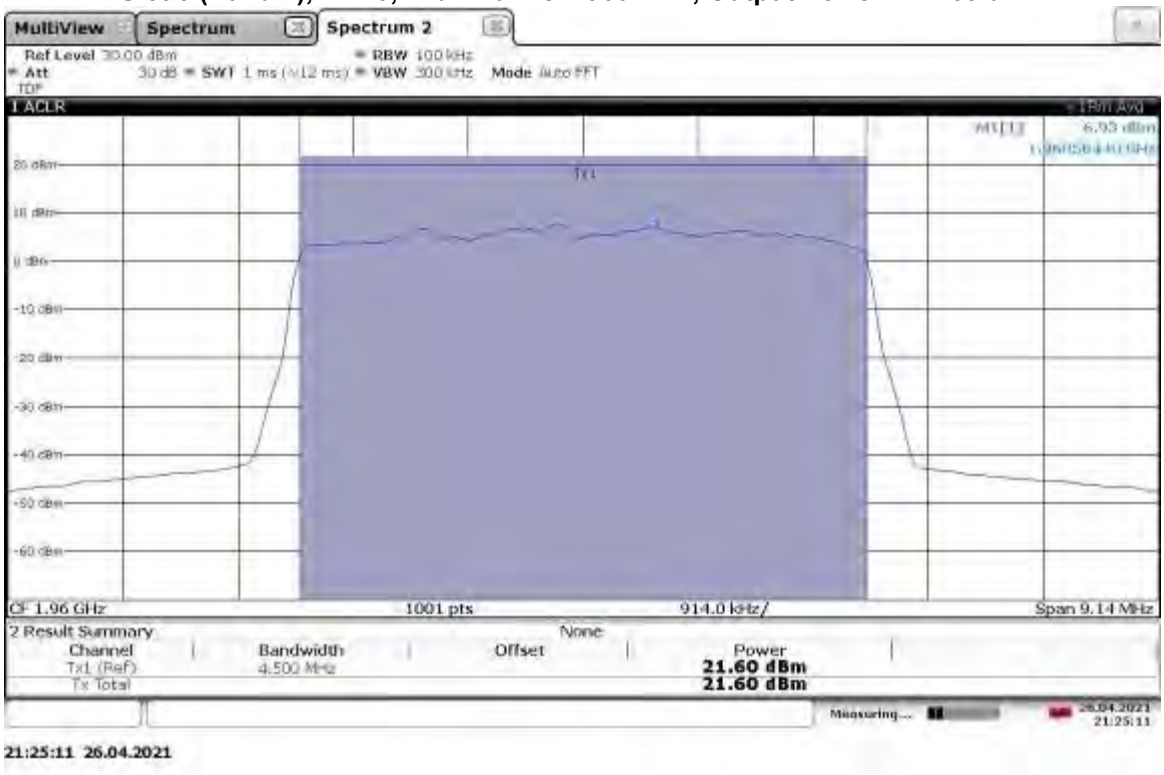
TM3.2-16QAM_5 MHz Bandwidth
Slot 0 (Band 2), ANT0, Low Channel 1932.5 MHz, Output Power = 20.62 dBm



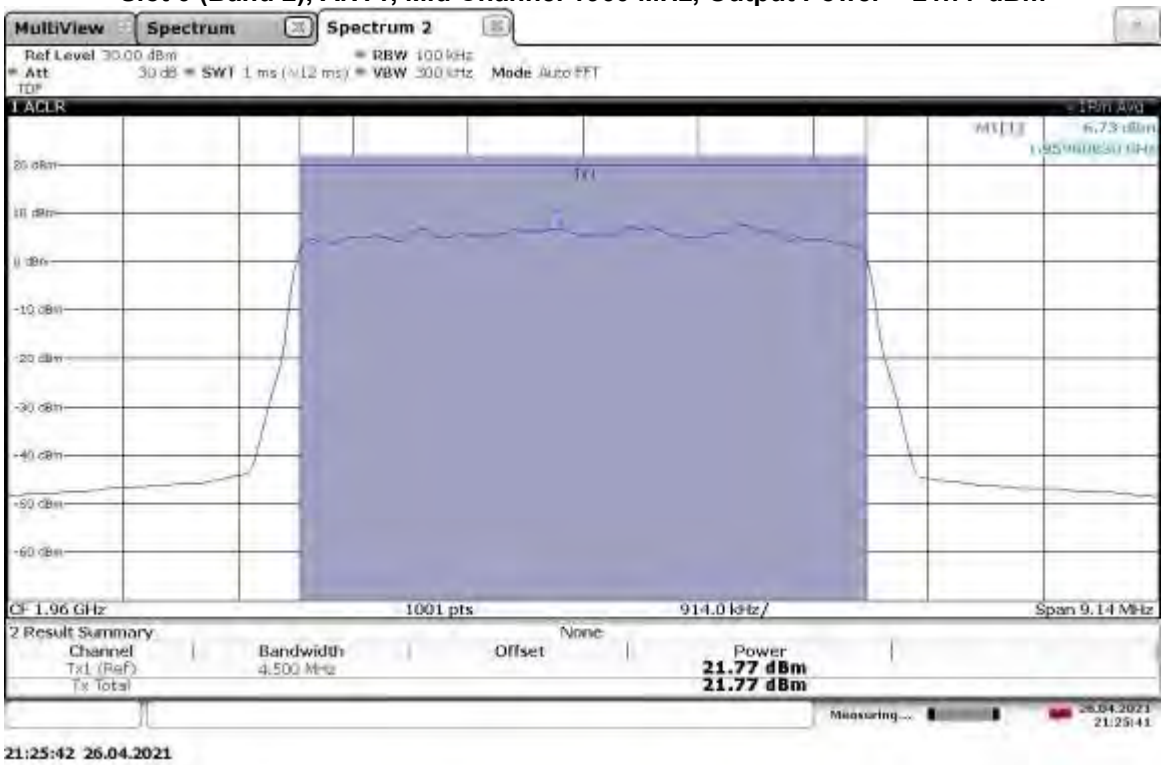
TM3.2-16QAM_5 MHz Bandwidth
Slot 0 (Band 2), ANT1, Low Channel 1932.5 MHz, Output Power = 20.93 dBm



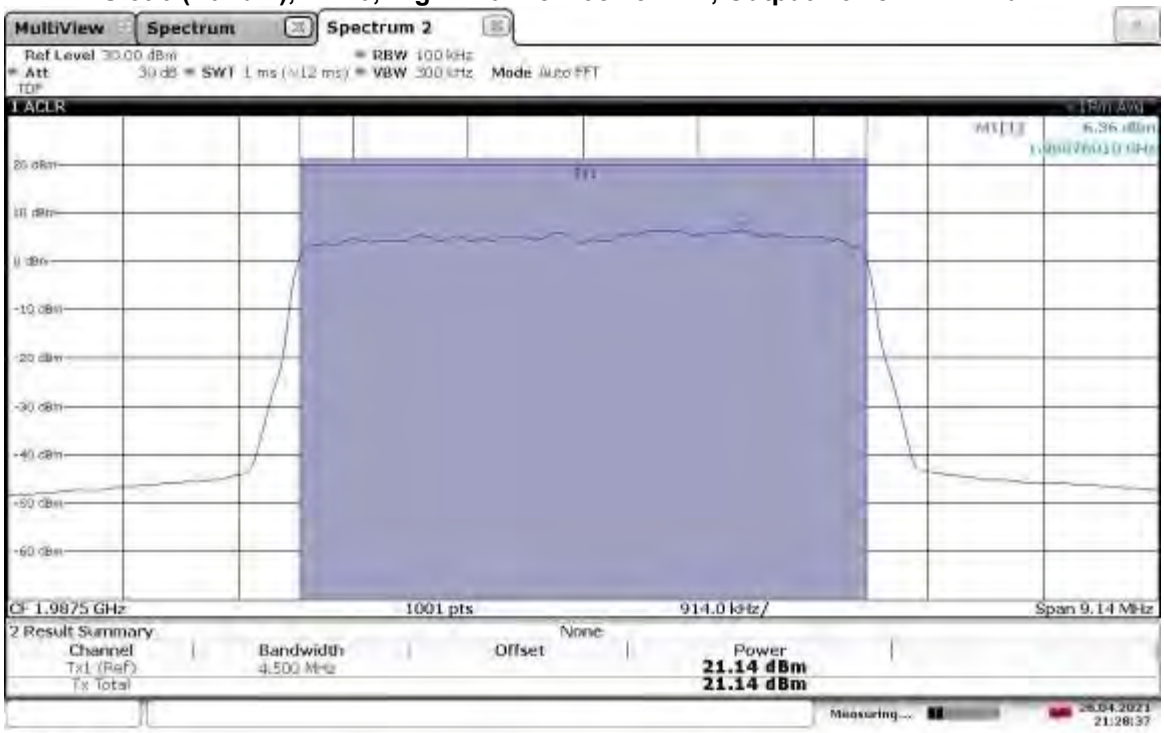
TM3.2-16QAM_5 MHz Bandwidth
Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, Output Power = 21.60 dBm



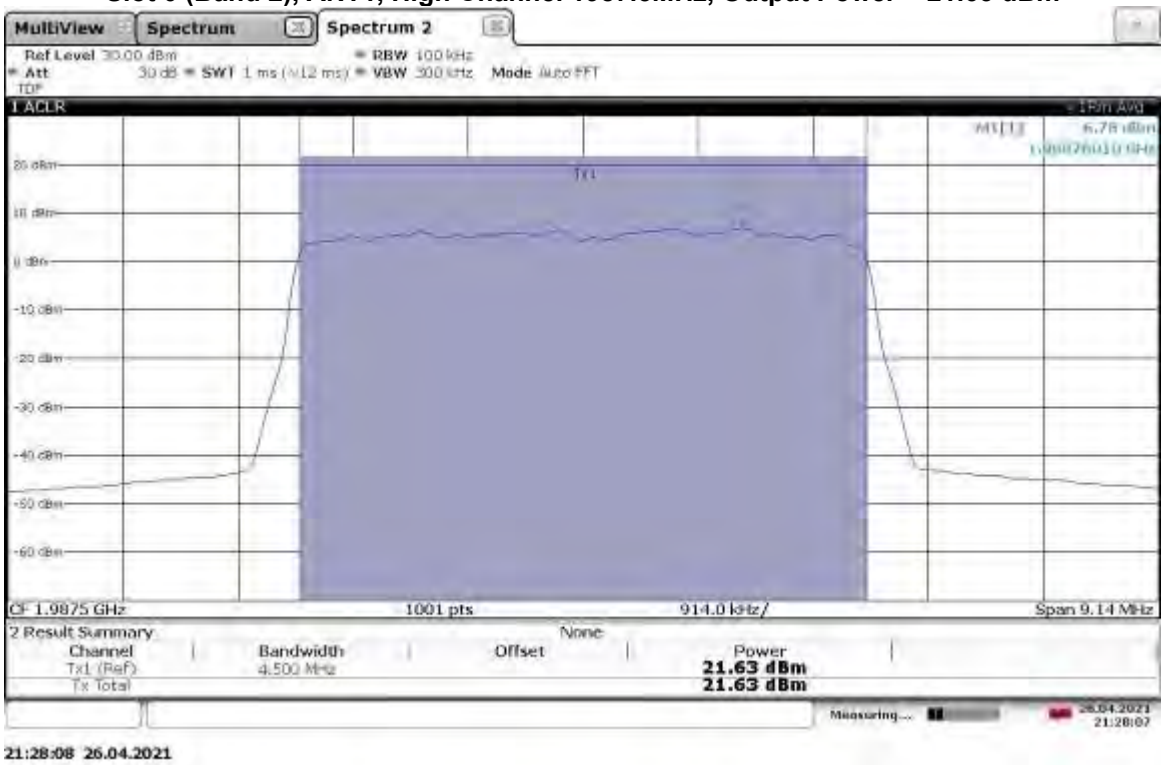
TM3.2-16QAM_5 MHz Bandwidth
Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 21.77 dBm



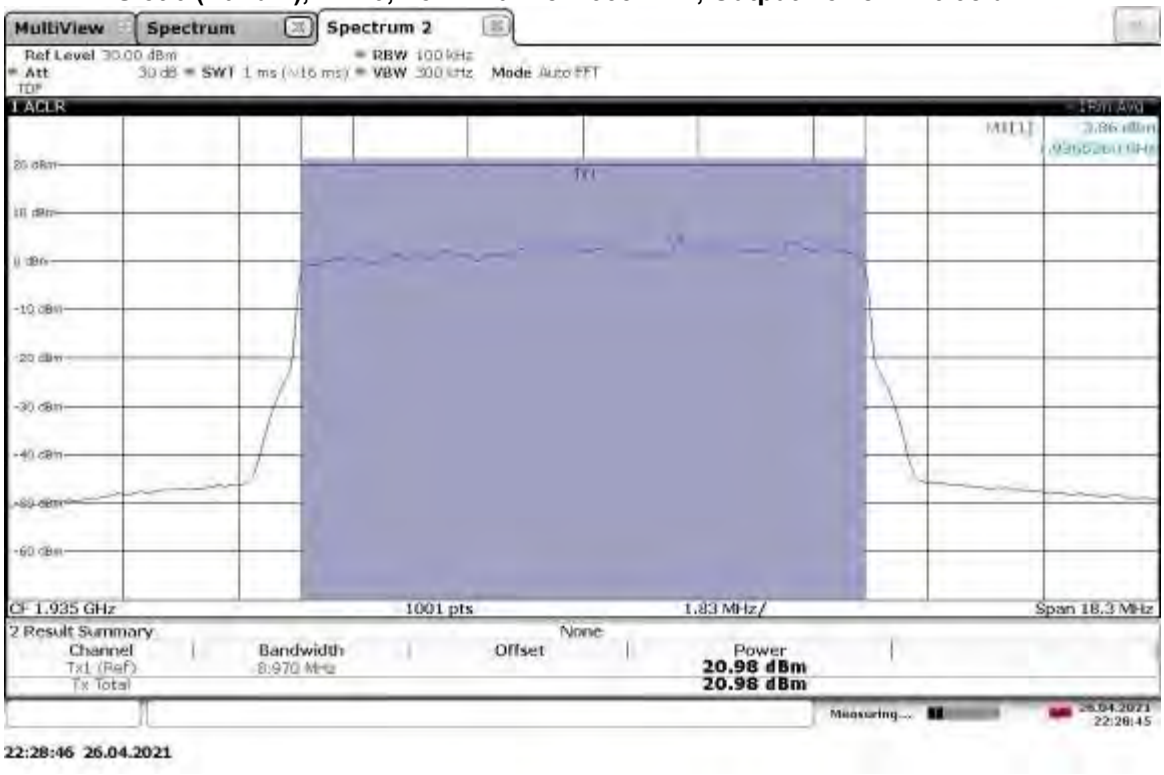
TM3.2-16QAM_5 MHz Bandwidth
Slot 0 (Band 2), ANT0, High Channel 1987.5 MHz, Output Power = 21.14 dBm



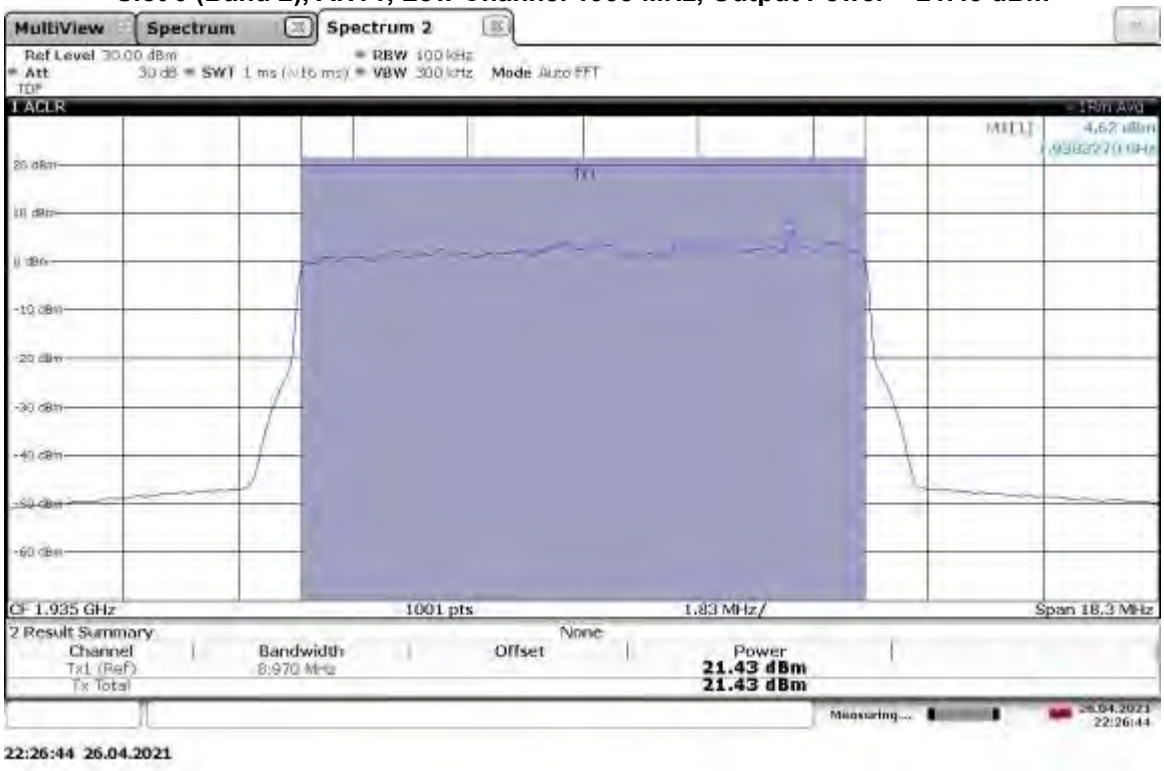
TM3.2-16QAM_5 MHz Bandwidth
Slot 0 (Band 2), ANT1, High Channel 1987.5MHz, Output Power = 21.63 dBm



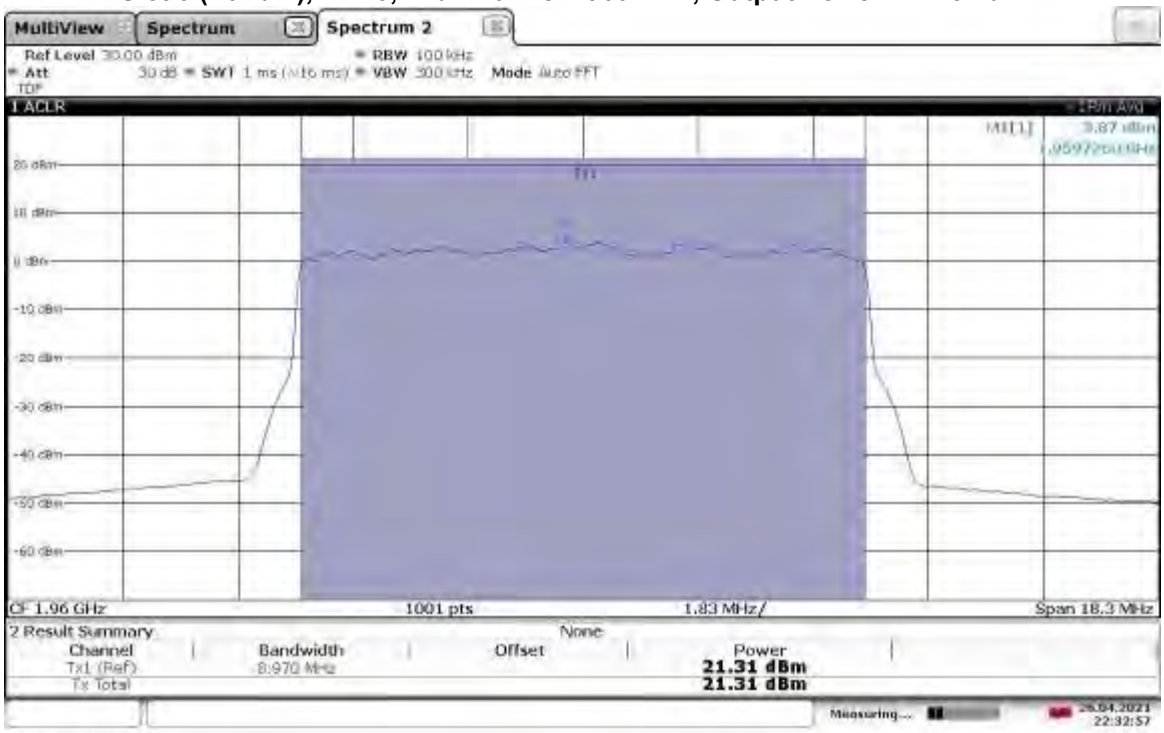
TM3.2-16QAM_10 MHz Bandwidth
Slot 0 (Band 2), ANT0, Low Channel 1935 MHz, Output Power = 20.98 dBm



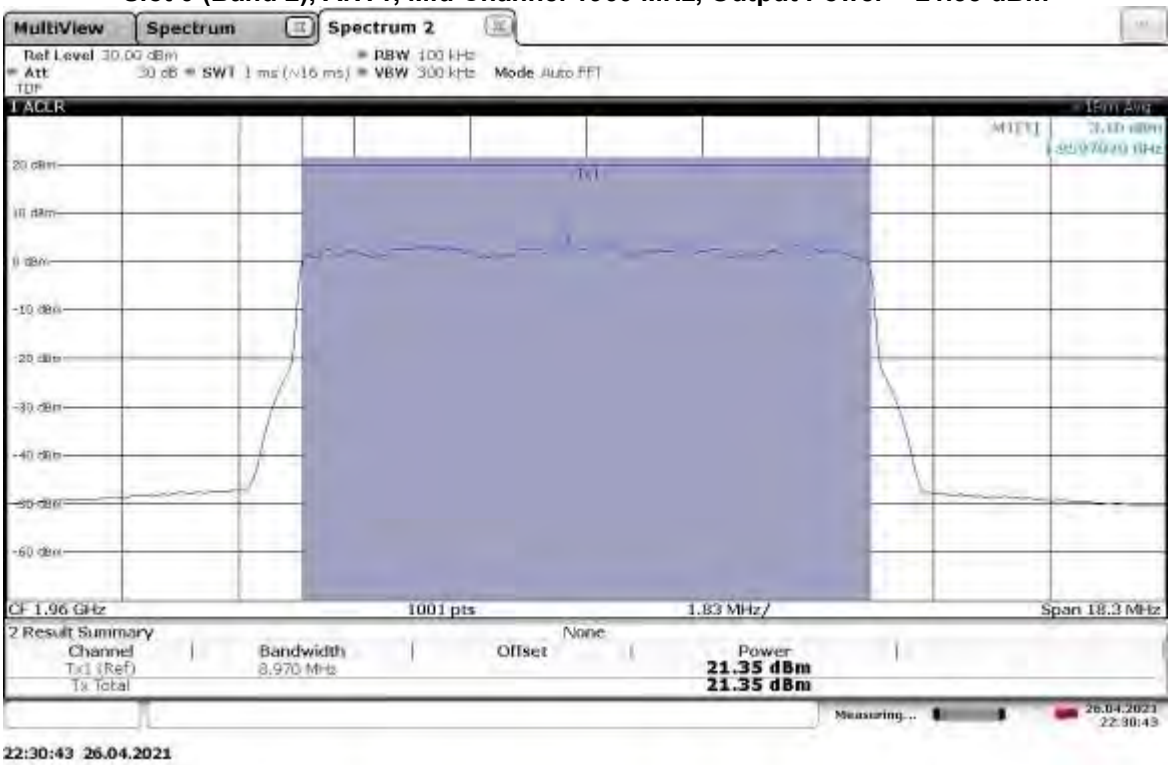
TM3.2-16QAM_10 MHz Bandwidth
Slot 0 (Band 2), ANT1, Low Channel 1935 MHz, Output Power = 21.43 dBm



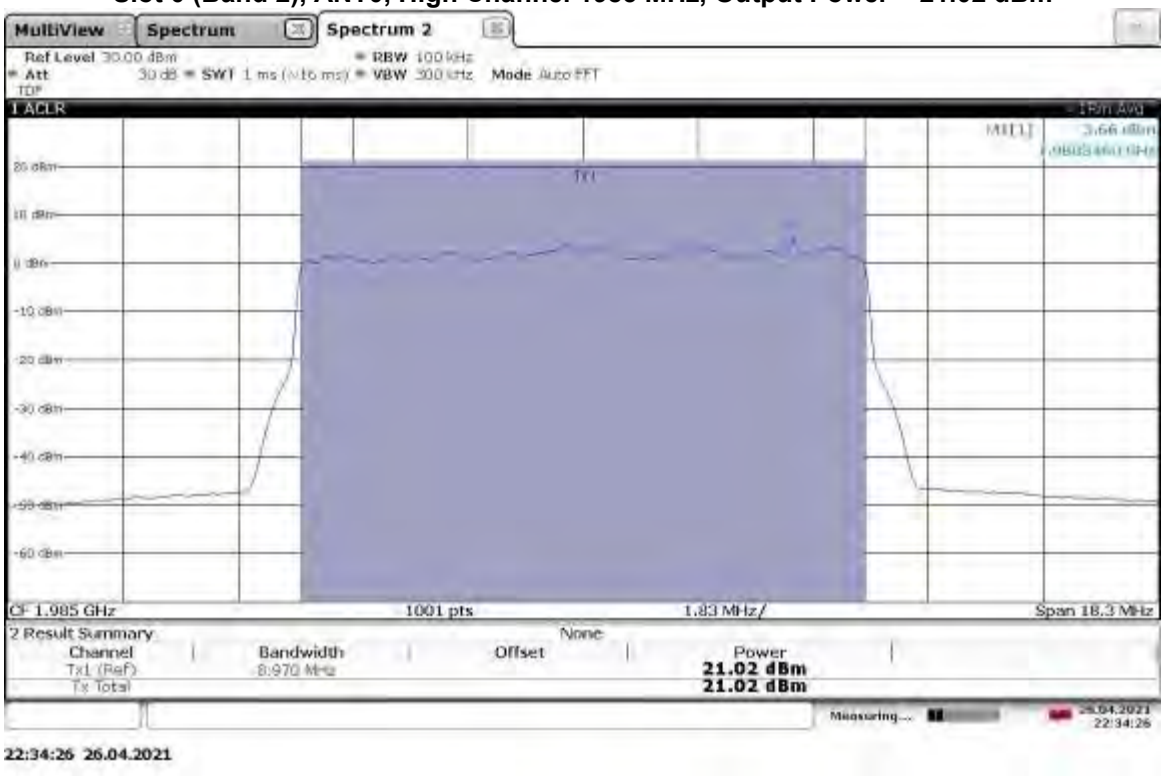
TM3.2-16QAM_10 MHz Bandwidth
Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, Output Power = 21.31 dBm



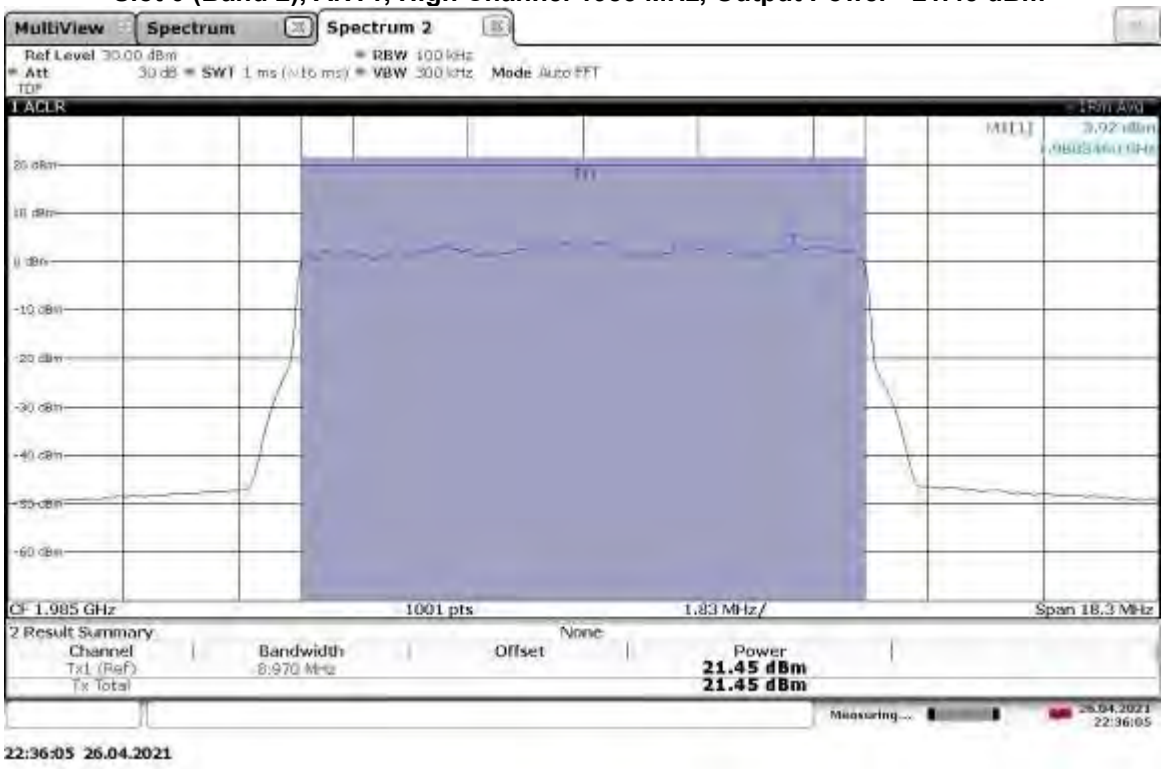
TM3.2-16QAM_10 MHz Bandwidth
Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 21.35 dBm



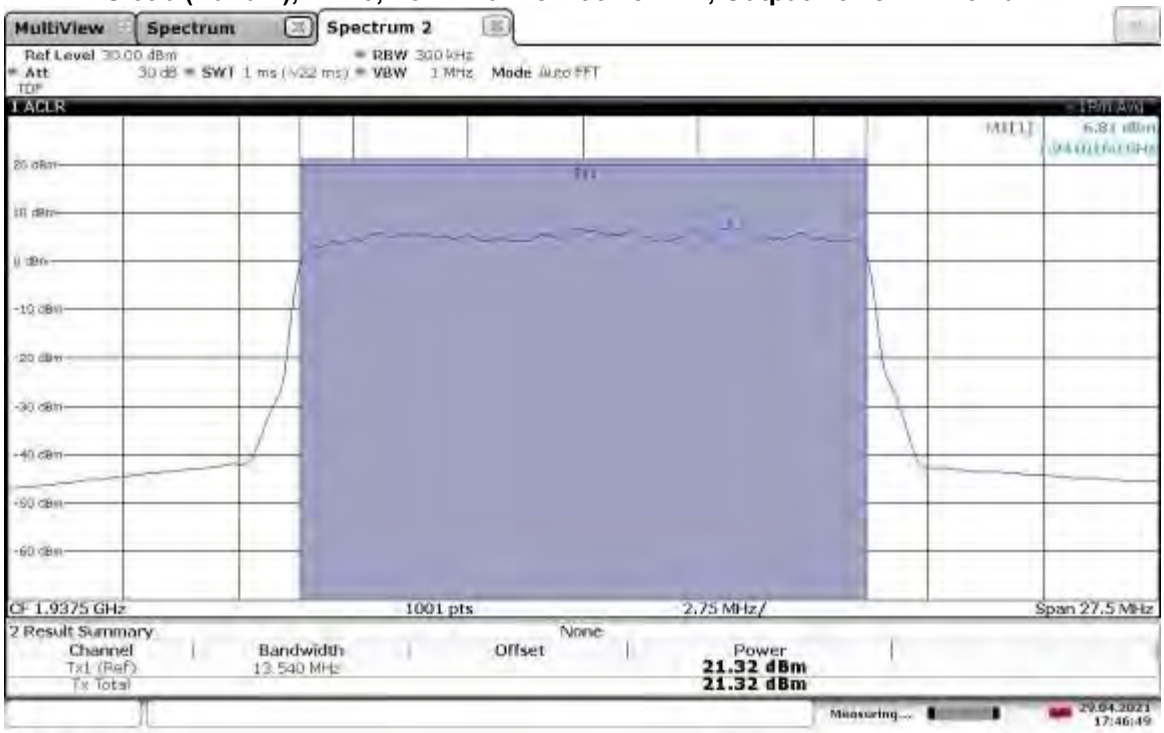
TM3.2-16QAM_10 MHz Bandwidth
Slot 0 (Band 2), ANT0, High Channel 1985 MHz, Output Power = 21.02 dBm



TM3.2-16QAM_10 MHz Bandwidth
Slot 0 (Band 2), ANT1, High Channel 1985 MHz, Output Power =21.45 dBm



TM3.2-16QAM_15 MHz Bandwidth
Slot 0 (Band 2), ANT0, Low Channel 1937.5 MHz, Output Power = 21.32 dBm



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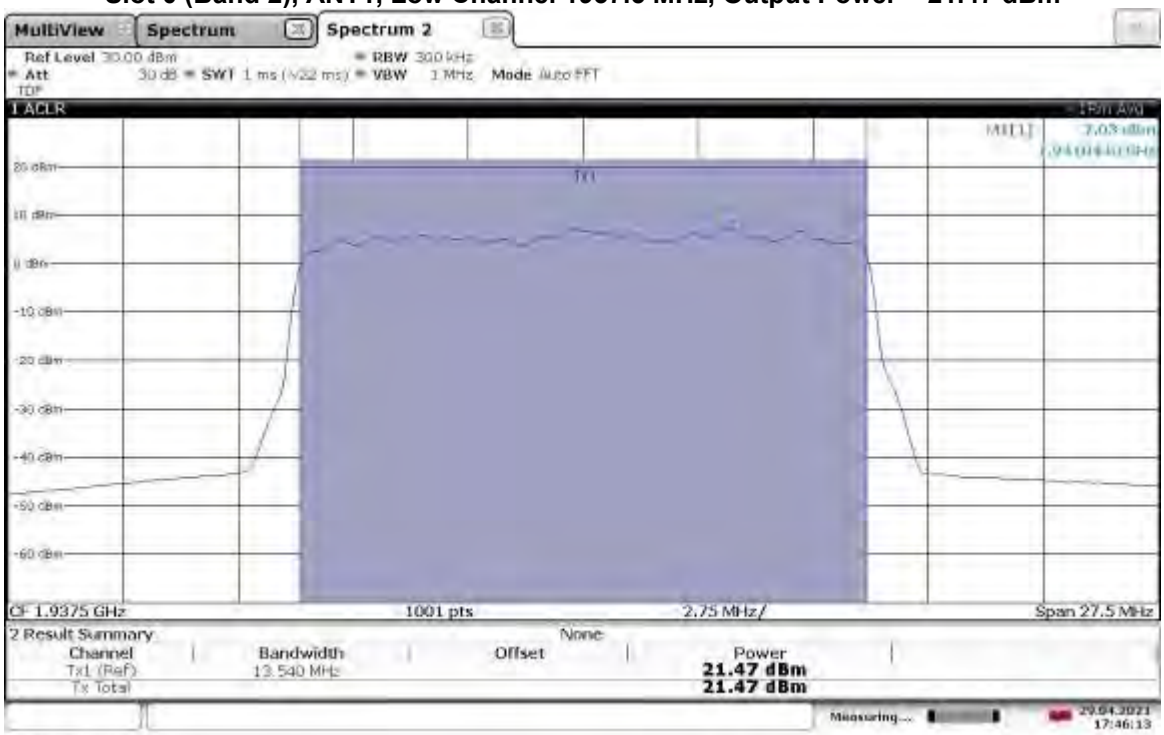
TM3.2-16QAM_15 MHz Bandwidth
Slot 0 (Band 2), ANT1, Low Channel 1937.5 MHz, Output Power = 21.47 dBm



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TM3.2-16QAM_15 MHz Bandwidth
Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, Output Power = 21.09 dBm

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TM3.2-16QAM_15 MHz Bandwidth
Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 21.29 dBm

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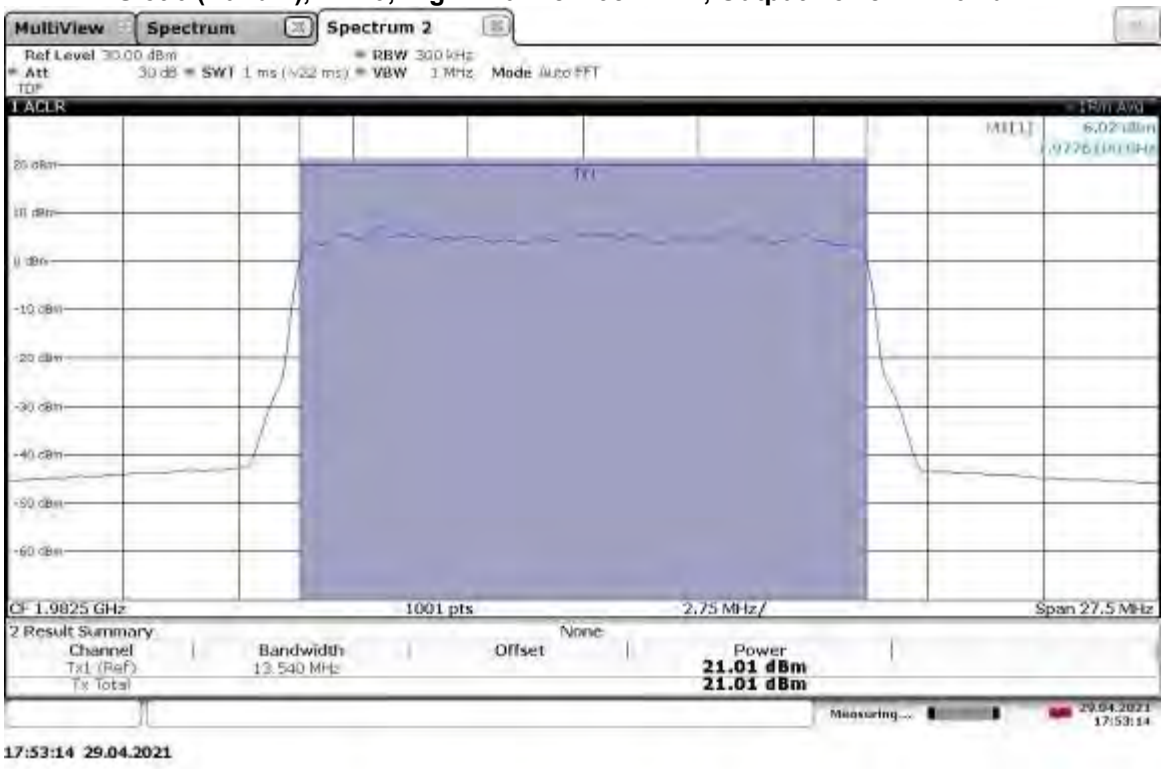
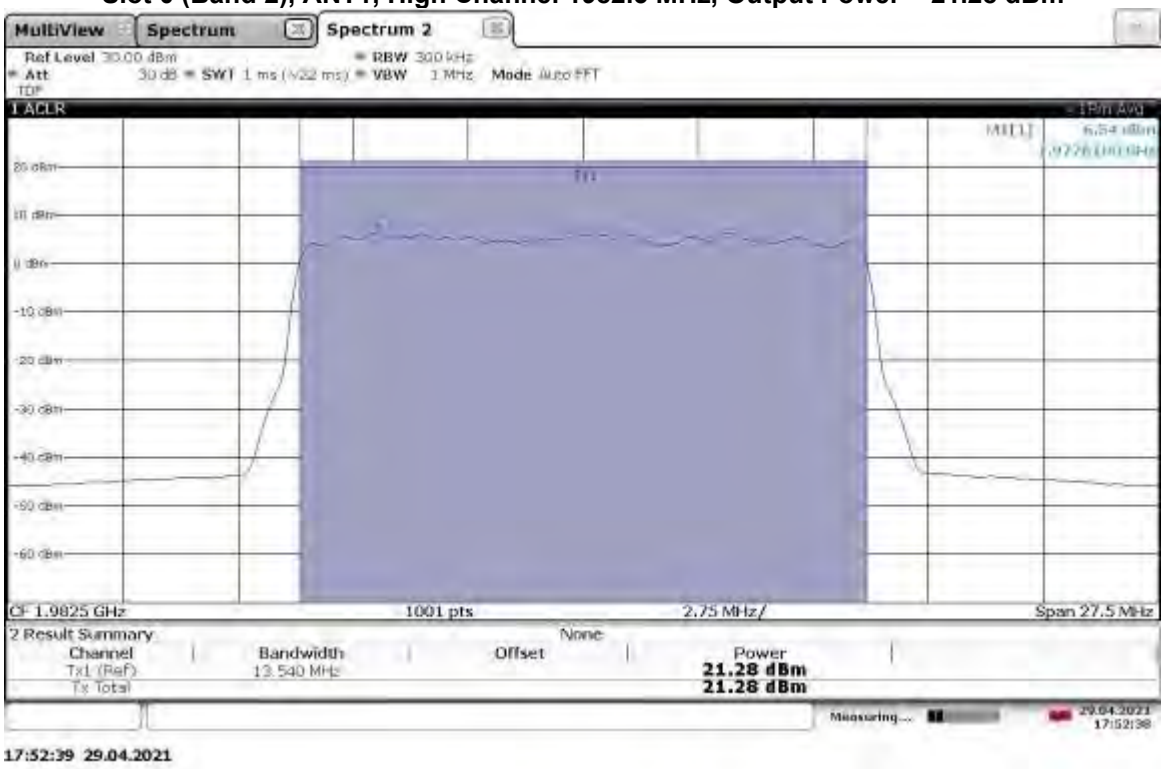
TM3.2-16QAM_15 MHz Bandwidth
Slot 0 (Band 2), ANT0, High Channel 1982 MHz, Output Power =21.01 dBm



17:53:14 29.04.2021

TM3.2-16QAM_15 MHz Bandwidth
Slot 0 (Band 2), ANT1, High Channel 1982.5 MHz, Output Power = 21.28 dBm



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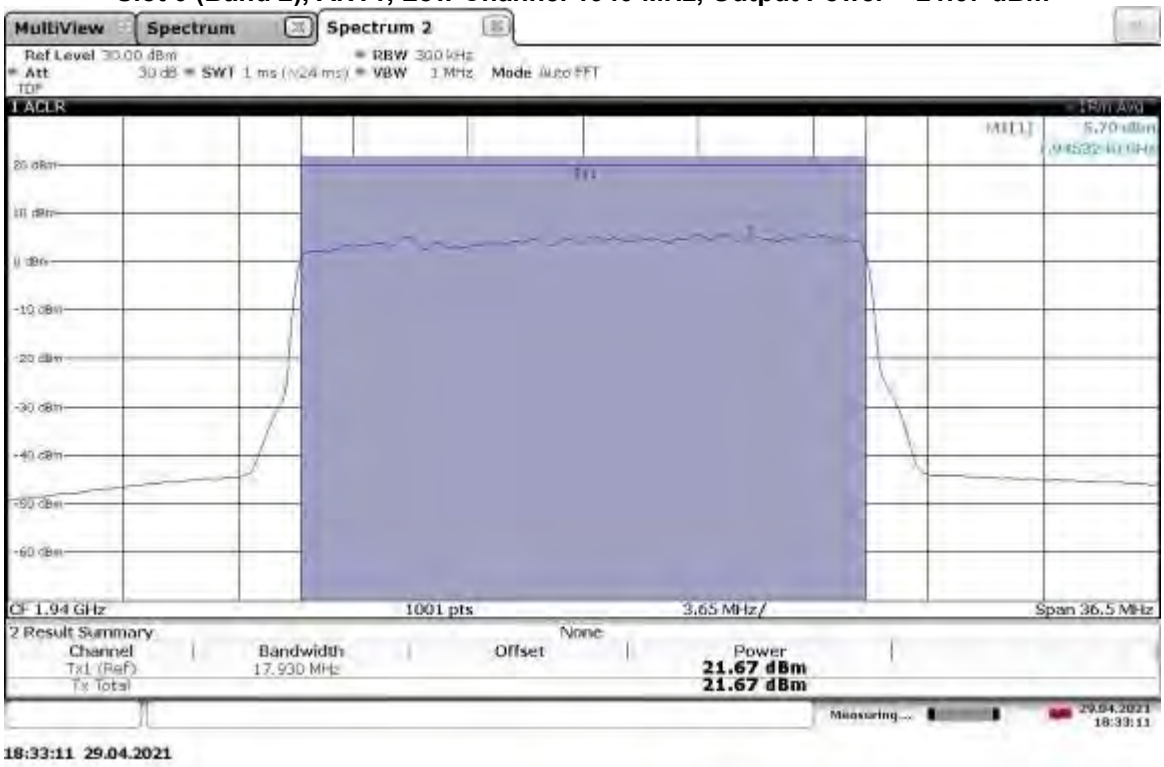
TM3.2-16QAM_20 MHz Bandwidth
Slot 0 (Band 2), ANT0, Low Channel 1940 MHz, Output Power = 21.42 dBm

TM3.2-16QAM_20 MHz Bandwidth
Slot 0 (Band 2), ANT1, Low Channel 1940 MHz, Output Power = 21.67 dBm



TM3.2-16QAM_20 MHz Bandwidth
Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, Output Power = 21.19 dBm

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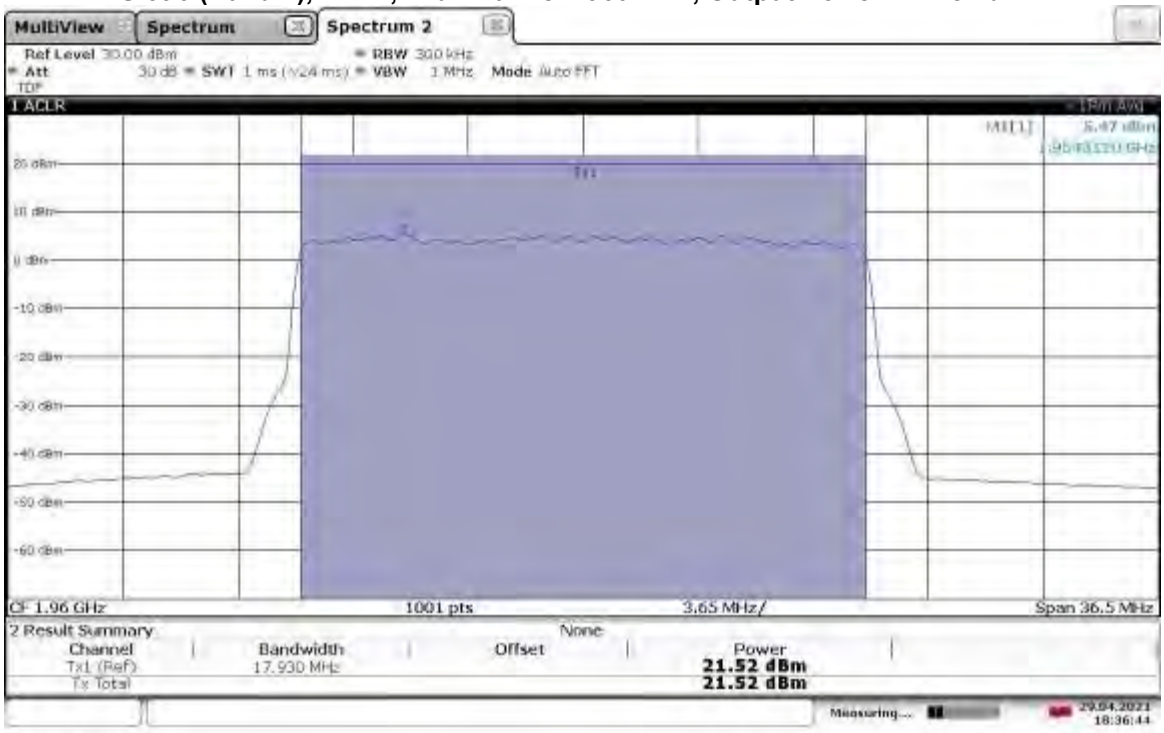
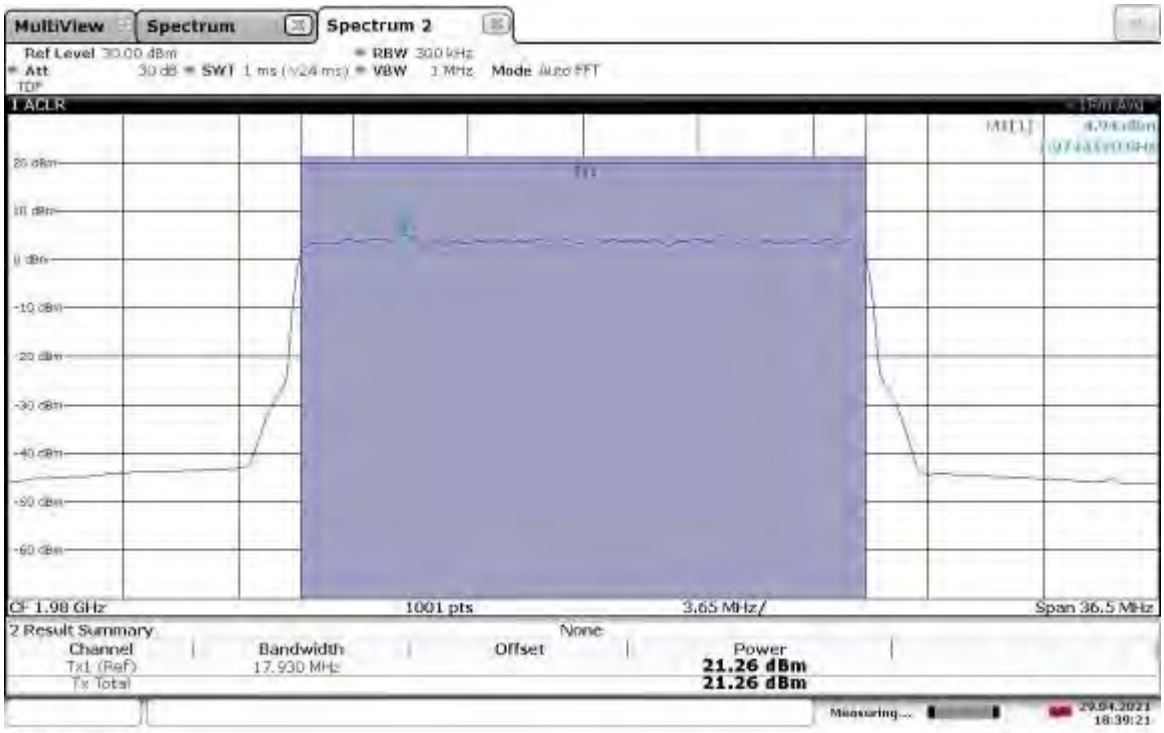
TM3.2-16QAM_20 MHz Bandwidth
Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 21.52 dBm



18:36:45 29.04.2021

TM3.2-16QAM_20 MHz Bandwidth
Slot 0 (Band 2), ANT0, High Channel 1980 MHz, Output Power = 21.26 dBm



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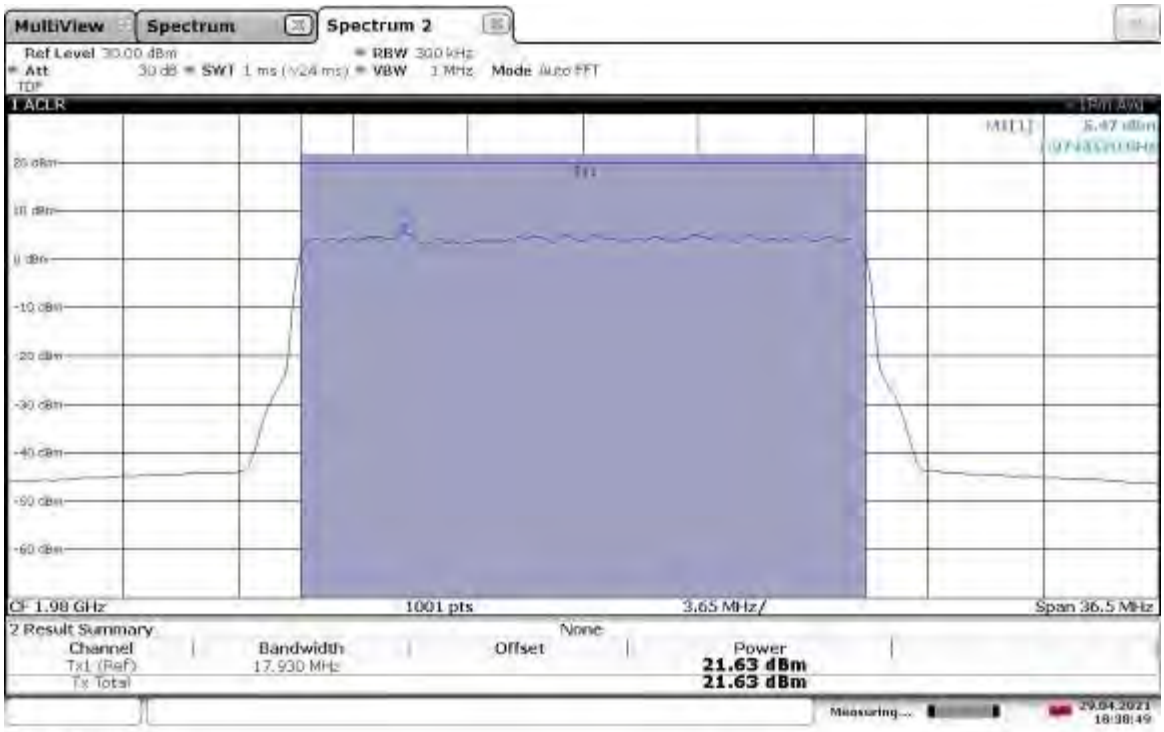
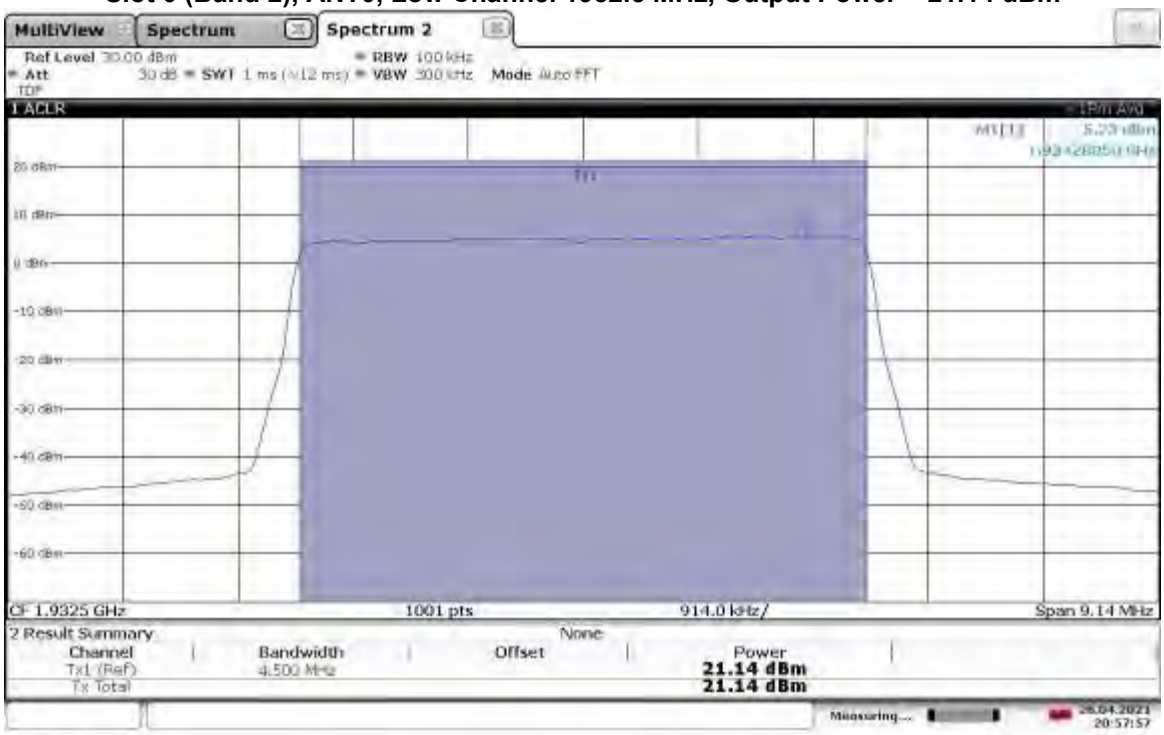
TM3.2-16QAM_20 MHz Bandwidth
Slot 0 (Band 2), ANT1, High Channel 1980 MHz, Output Power = 21.63 dBm



18:38:49 29.04.2021

TM3.1-64QAM_5 MHz Bandwidth
Slot 0 (Band 2), ANT0, Low Channel 1932.5 MHz, Output Power = 21.14 dBm



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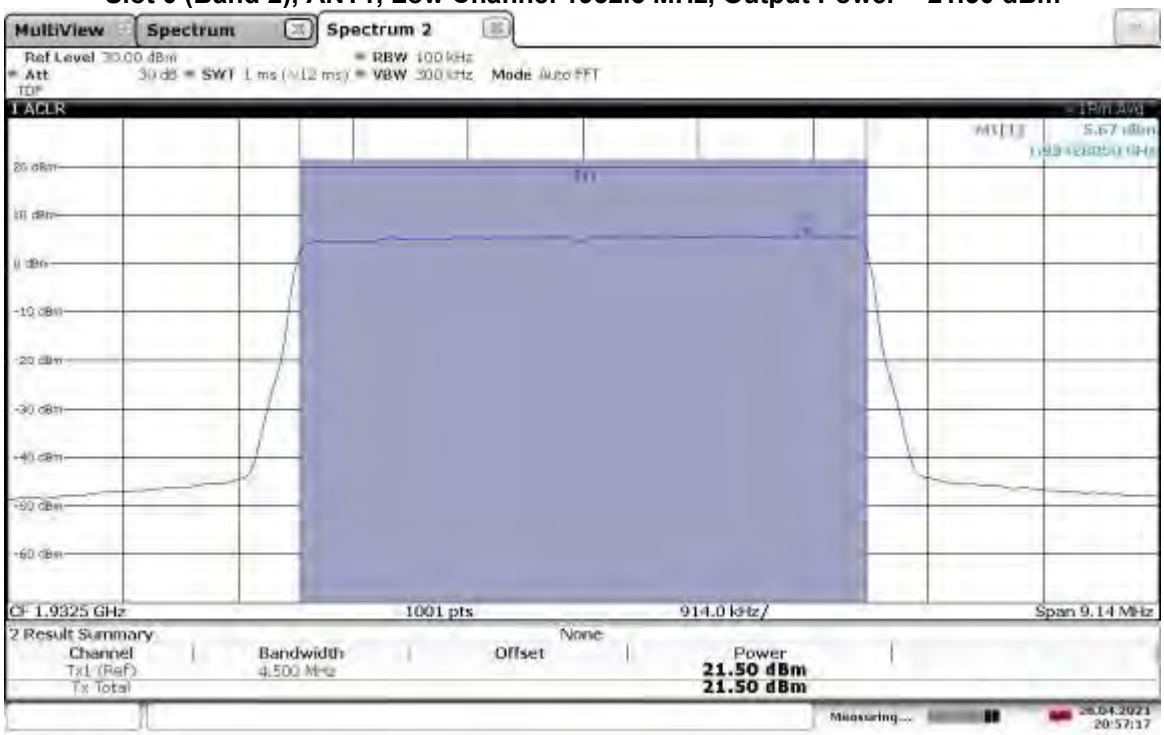
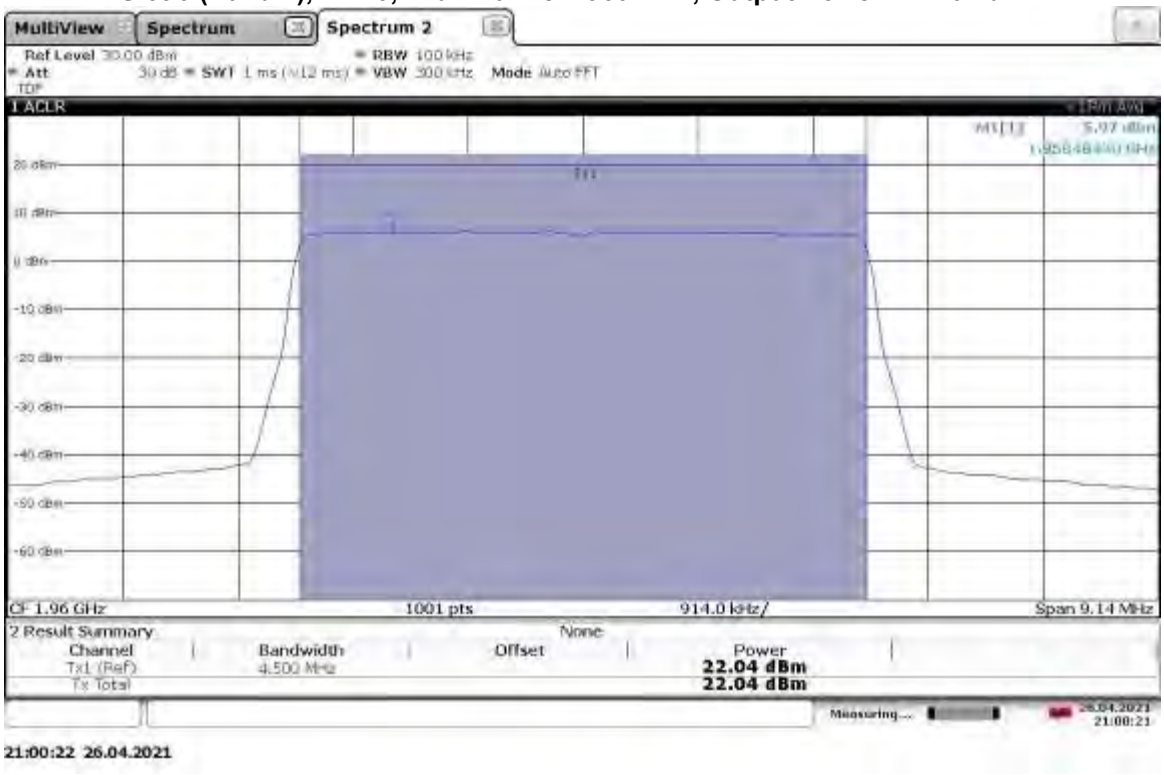
TM3.1-64QAM_5 MHz Bandwidth
Slot 0 (Band 2), ANT1, Low Channel 1932.5 MHz, Output Power = 21.50 dBm

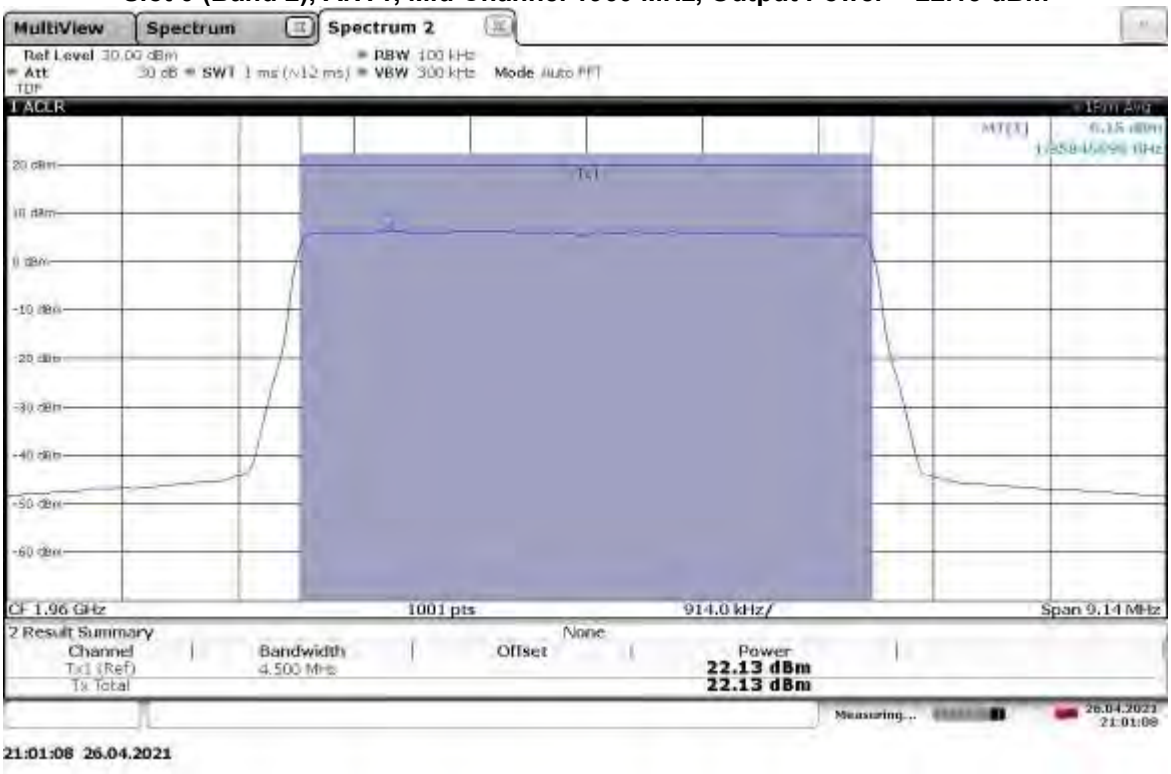


20:57:17 26.04.2021

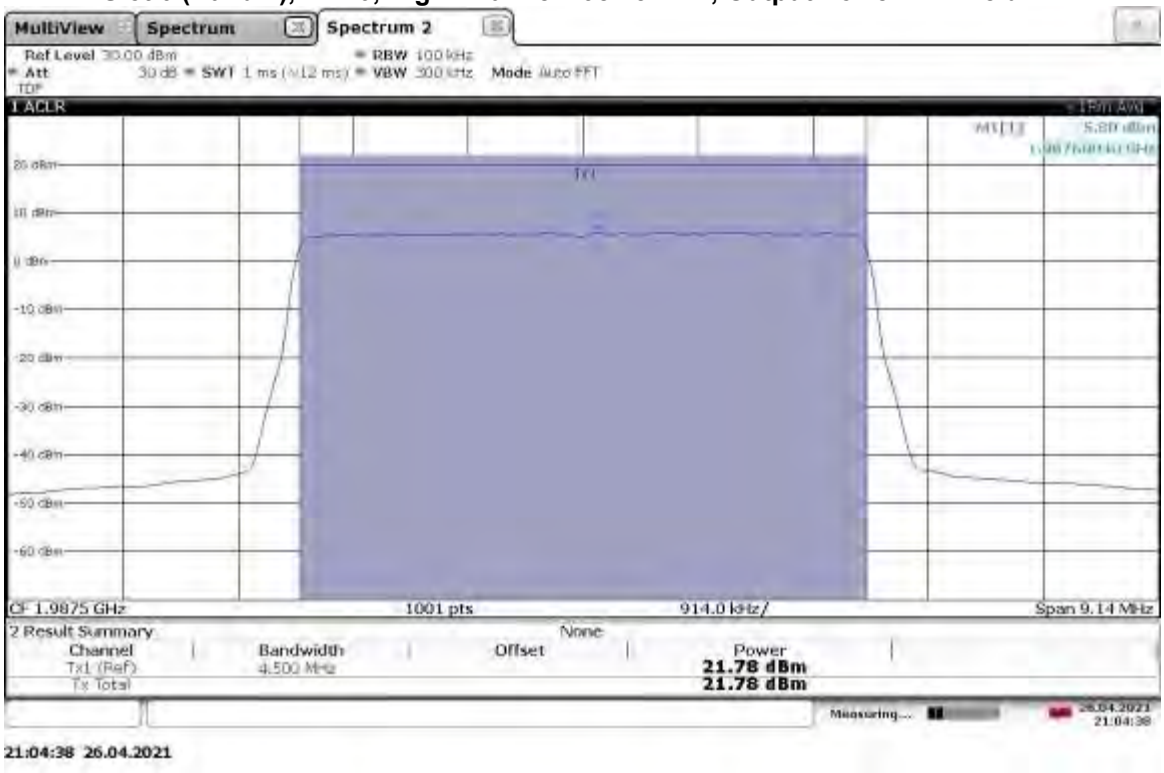
TM3.1-64QAM_5 MHz Bandwidth
Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, Output Power = 22.04 dBm



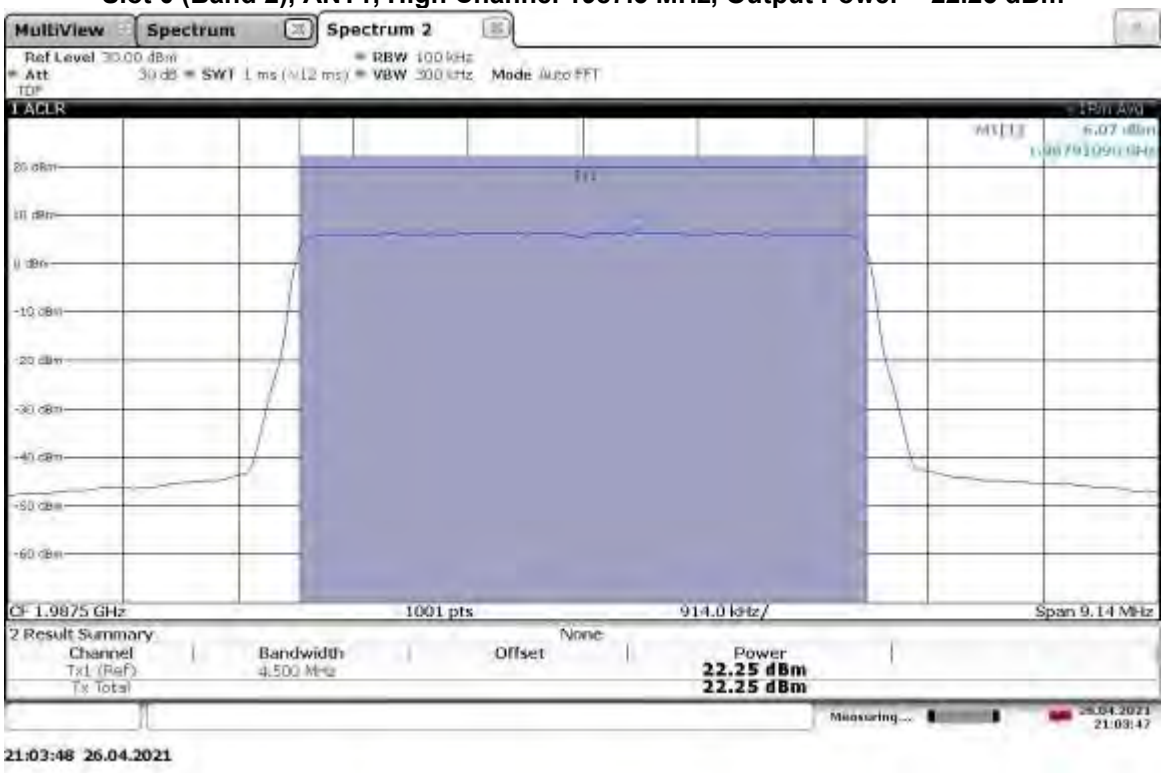
TM3.1-64QAM_5 MHz Bandwidth
Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 22.13 dBm



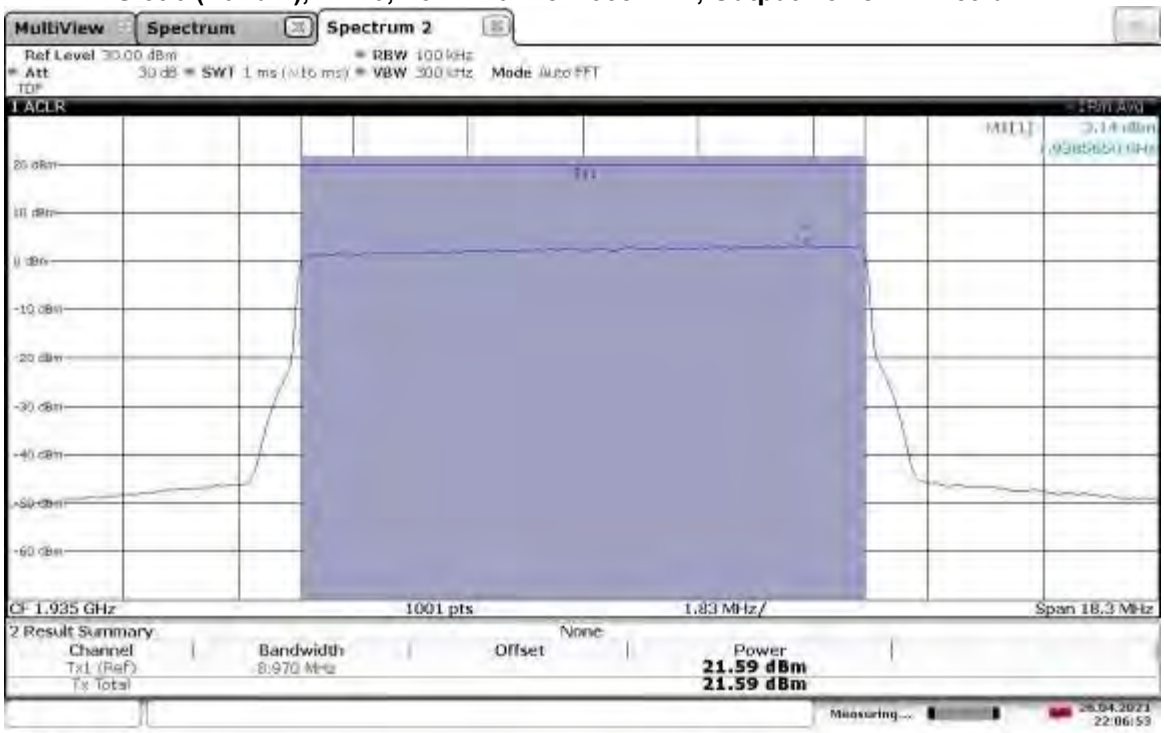
TM3.1-64QAM_5 MHz Bandwidth
Slot 0 (Band 2), ANT0, High Channel 1987.5 MHz, Output Power = 21.78 dBm



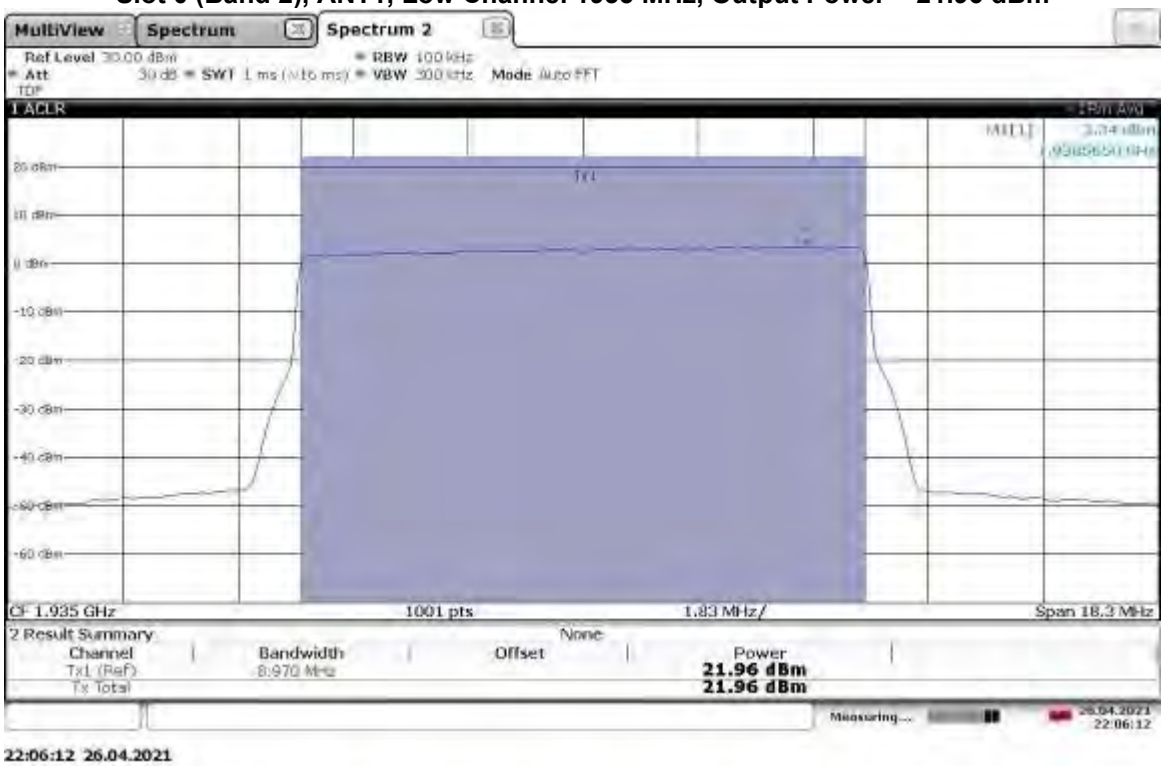
TM3.1-64QAM_5 MHz Bandwidth
Slot 0 (Band 2), ANT1, High Channel 1987.5 MHz, Output Power = 22.25 dBm



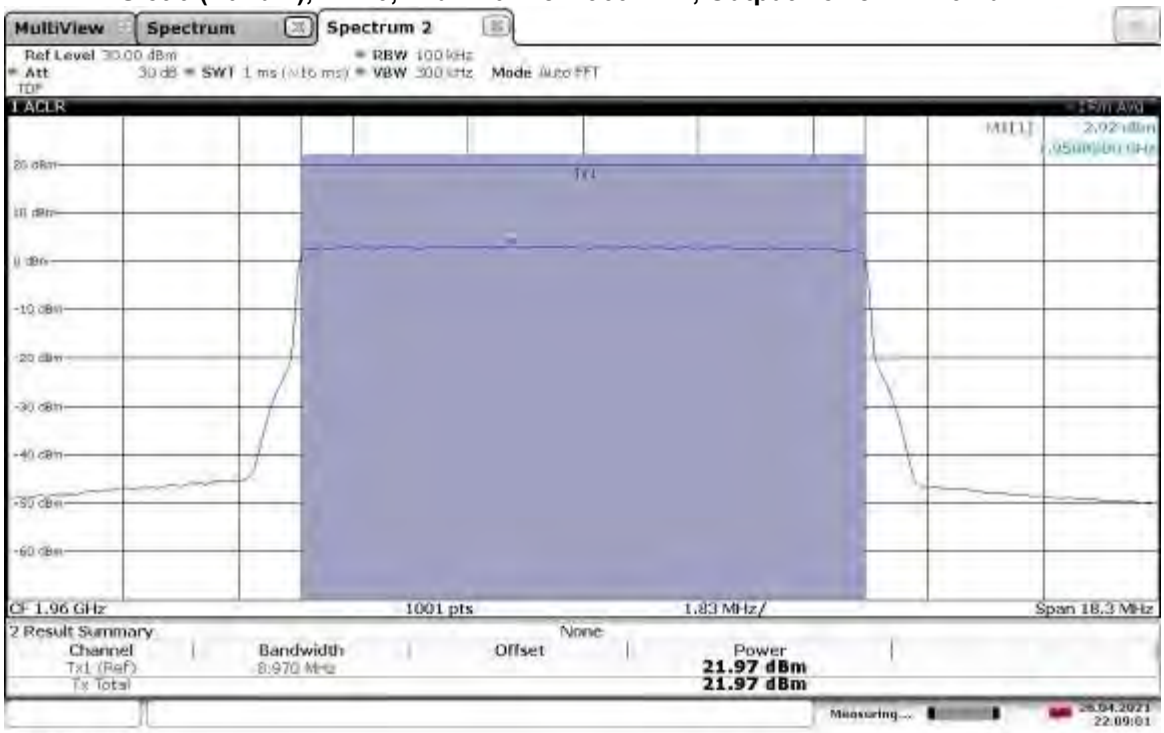
TM3.1-64QAM_10 MHz Bandwidth
Slot 0 (Band 2), ANT0, Low Channel 1935 MHz, Output Power = 21.59 dBm



TM3.1-64QAM_10 MHz Bandwidth
Slot 0 (Band 2), ANT1, Low Channel 1935 MHz, Output Power = 21.96 dBm

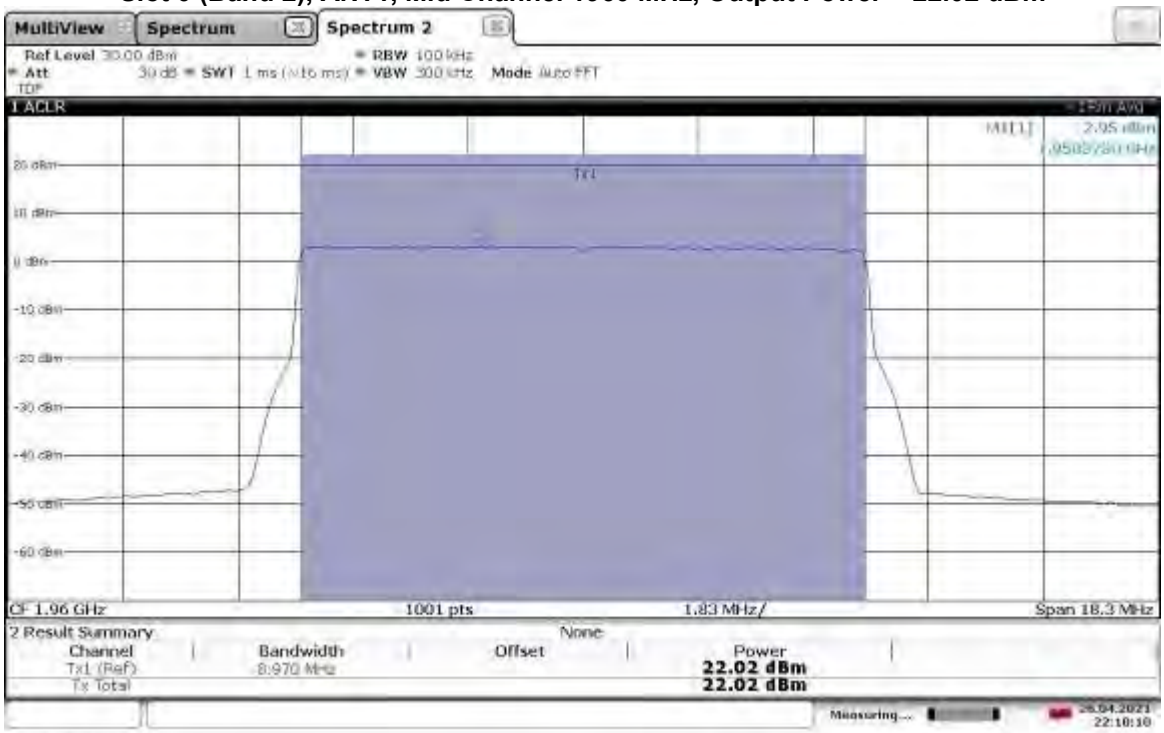


TM3.1-64QAM_10 MHz Bandwidth
Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, Output Power = 21.97 dBm



22:09:01 26.04.2021

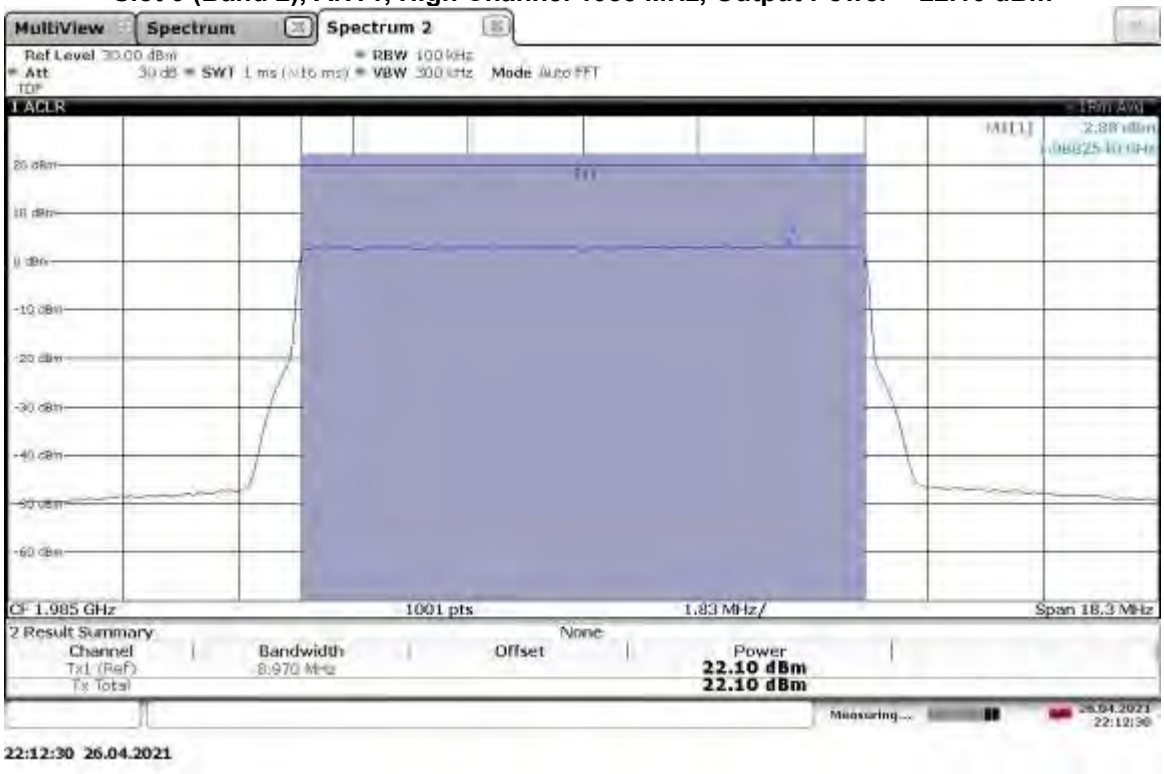
TM3.1-64QAM_10 MHz Bandwidth
Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 22.02 dBm



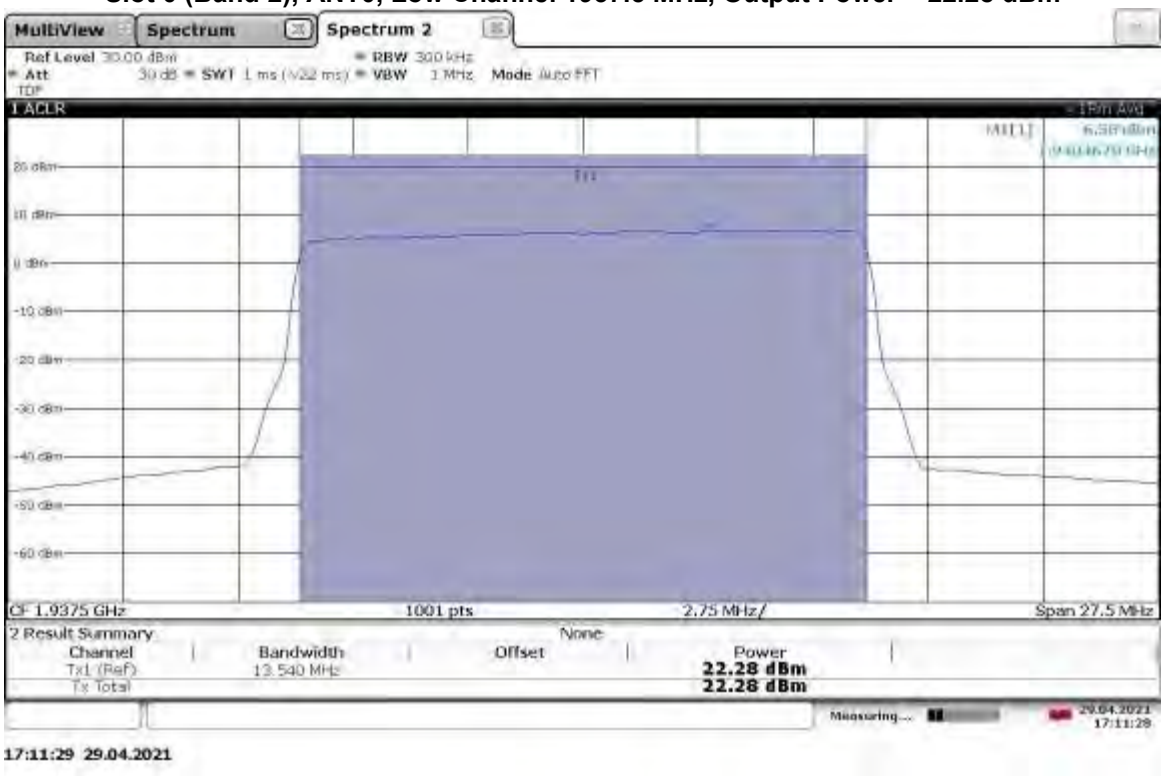
22:10:10 26.04.2021

TM3.1-64QAM_10 MHz Bandwidth
Slot 0 (Band 2), ANT0, High Channel 1985 MHz, Output Power = 21.55 dBm

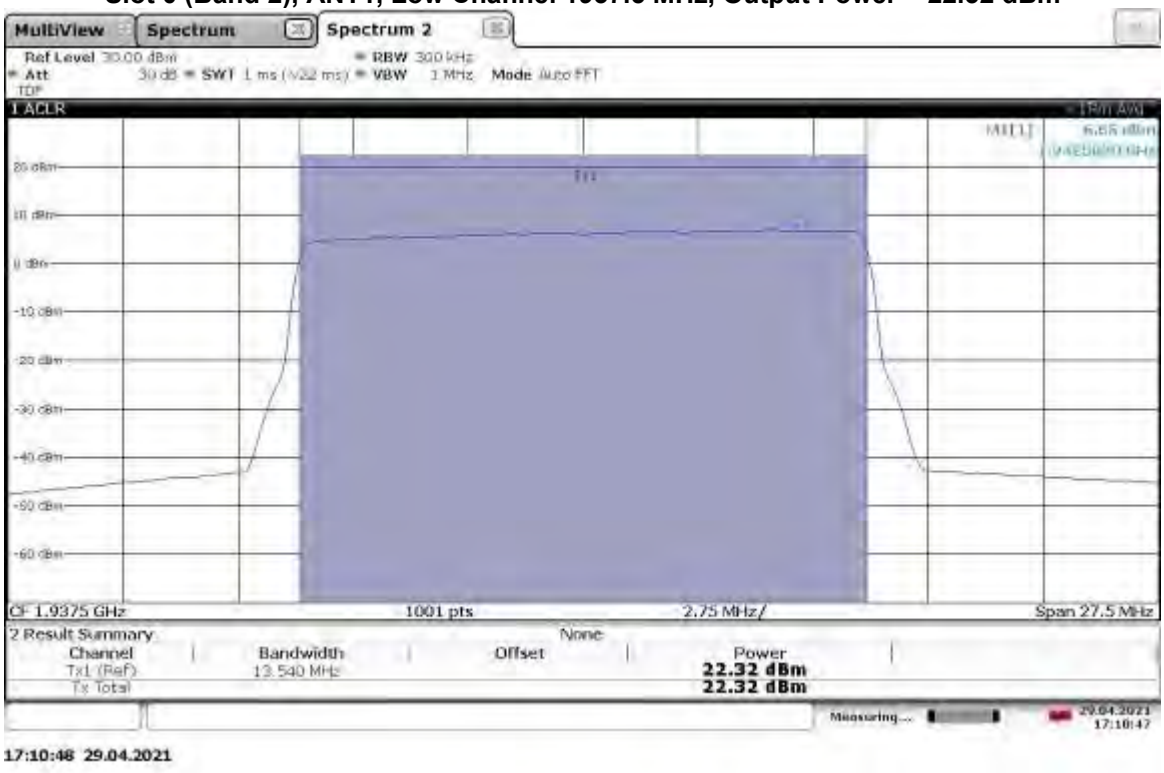
TM3.1-64QAM_10 MHz Bandwidth
Slot 0 (Band 2), ANT1, High Channel 1985 MHz, Output Power = 22.10 dBm



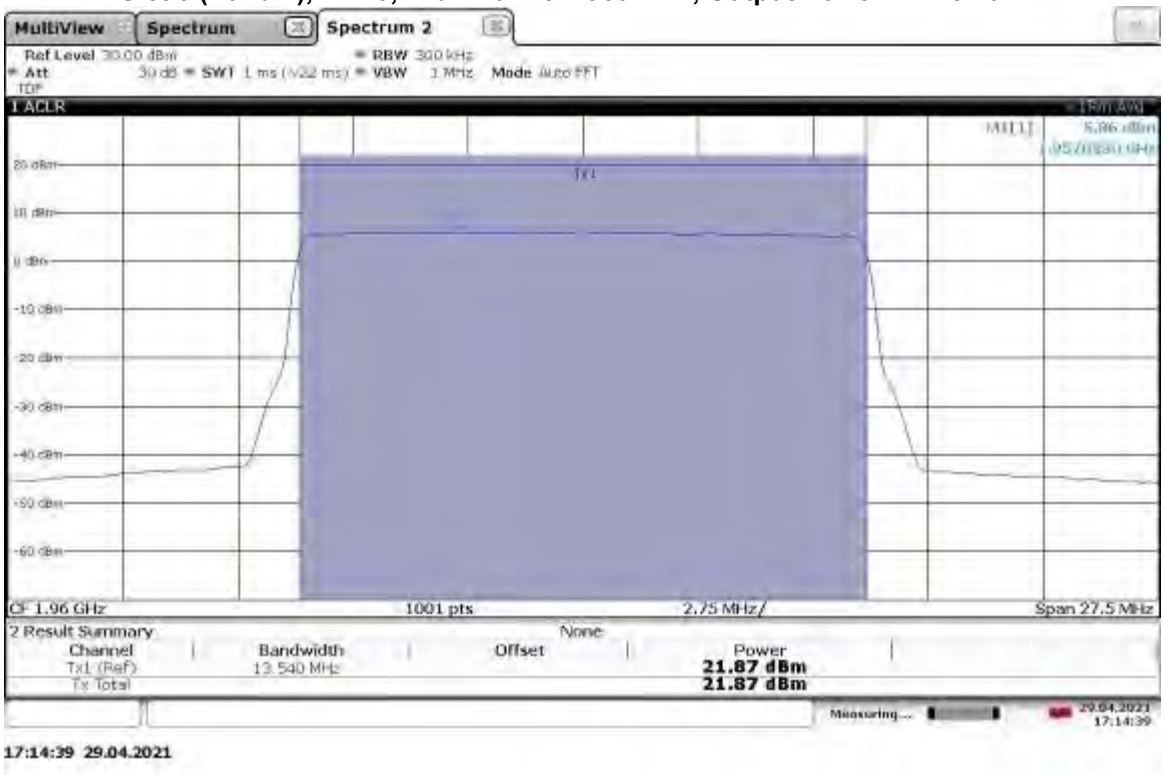
TM3.1-64QAM_15 MHz Bandwidth
Slot 0 (Band 2), ANT0, Low Channel 1937.5 MHz, Output Power = 22.28 dBm



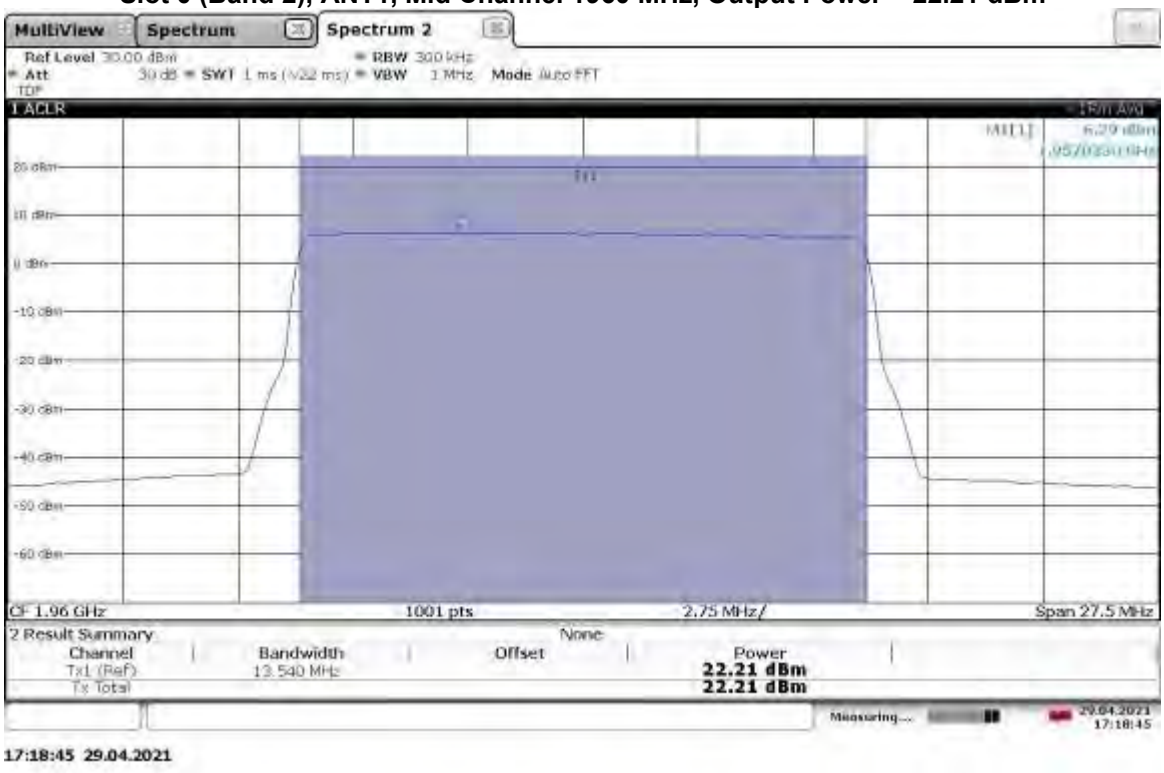
TM3.1-64QAM_15 MHz Bandwidth
Slot 0 (Band 2), ANT1, Low Channel 1937.5 MHz, Output Power = 22.32 dBm



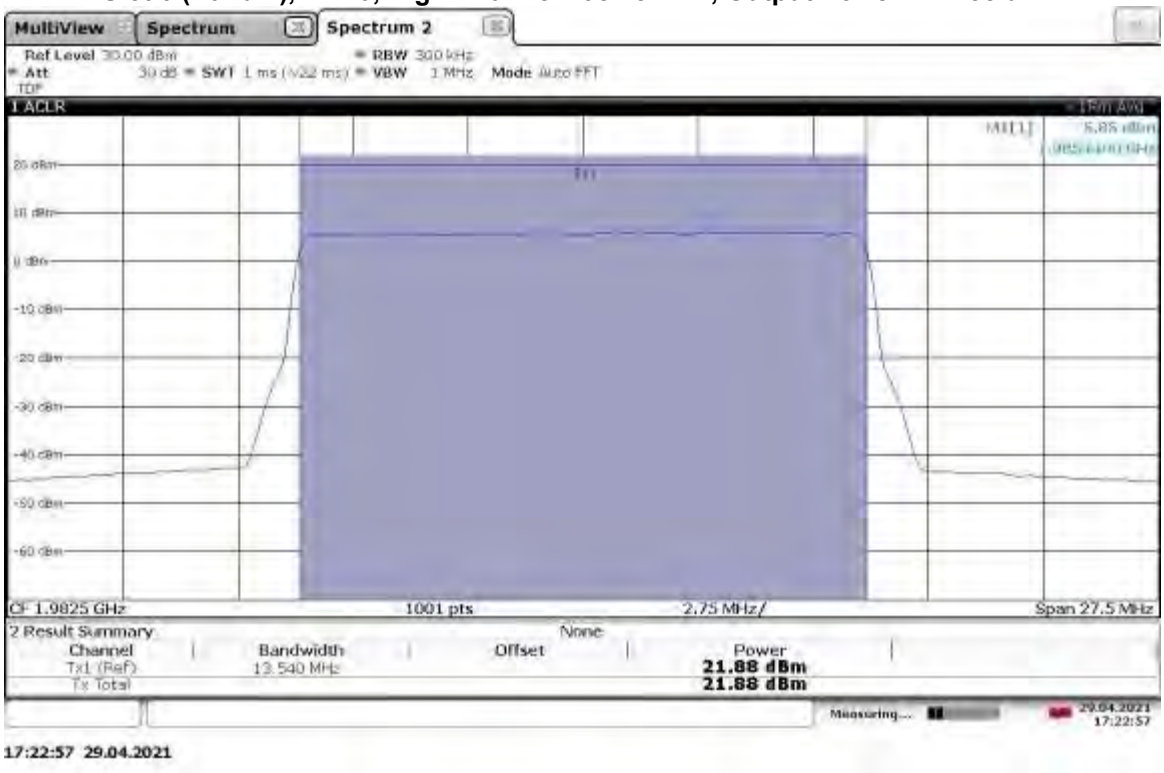
TM3.1-64QAM_15 MHz Bandwidth
Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, Output Power = 21.87 dBm



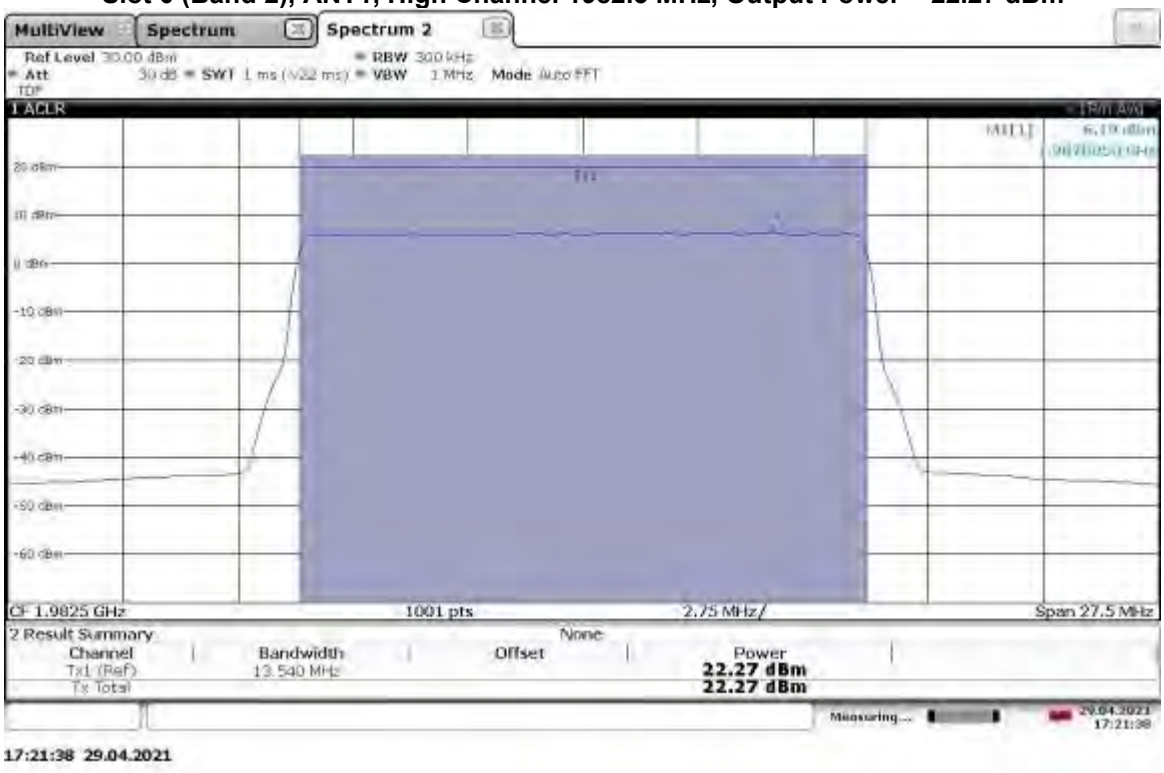
TM3.1-64QAM_15 MHz Bandwidth
Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 22.21 dBm



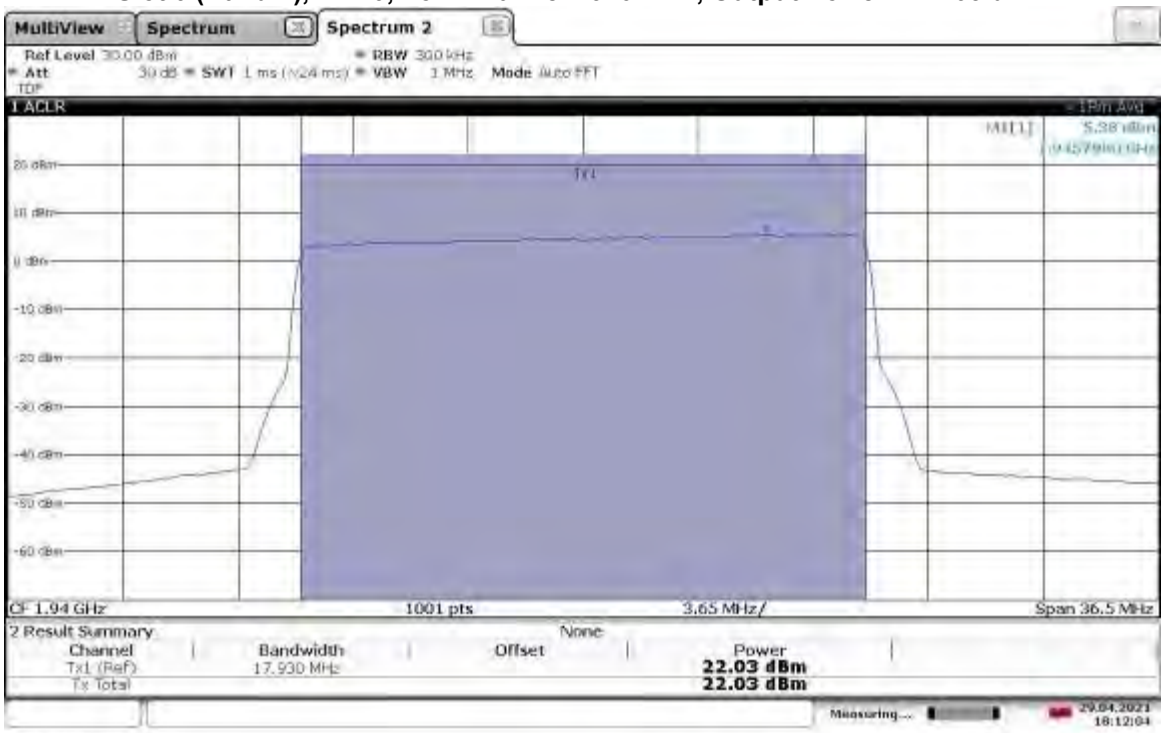
TM3.1-64QAM_15 MHz Bandwidth
Slot 0 (Band 2), ANT0, High Channel 1982.5 MHz, Output Power = 21.88 dBm



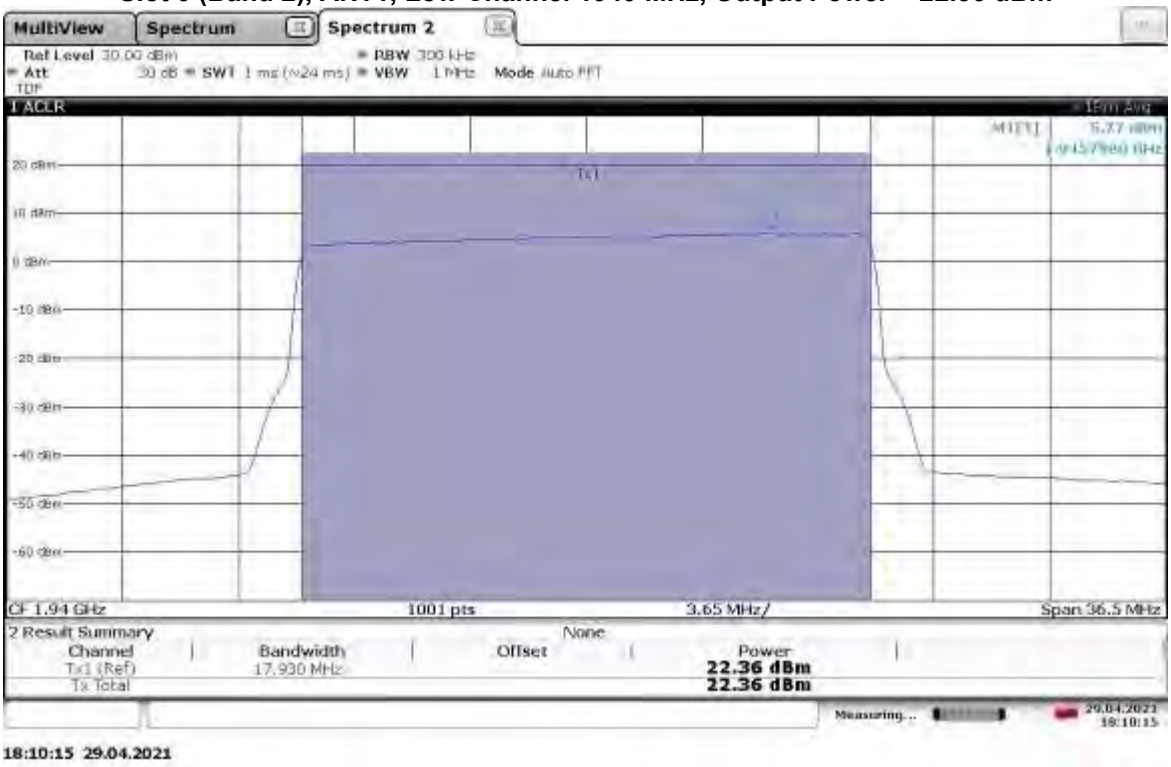
TM3.1-64QAM_15 MHz Bandwidth
Slot 0 (Band 2), ANT1, High Channel 1982.5 MHz, Output Power = 22.27 dBm



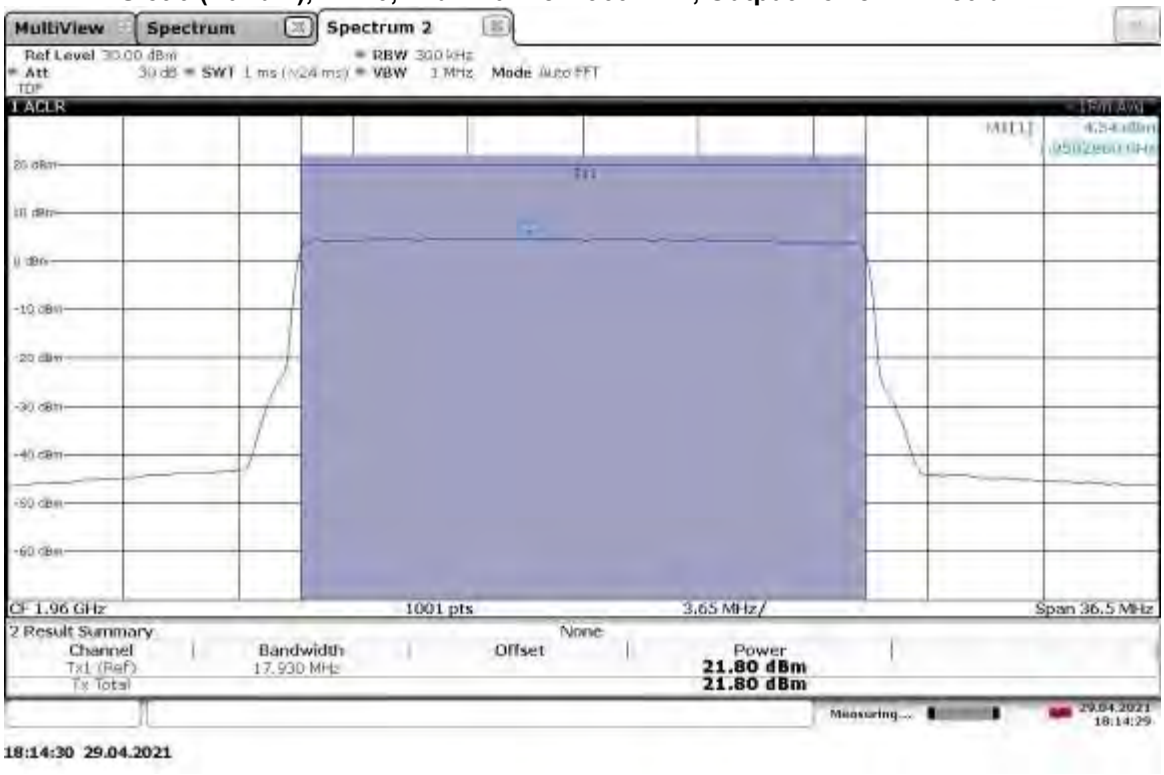
TM3.1-64QAM_20 MHz Bandwidth
Slot 0 (Band 2), ANT0, Low Channel 1940 MHz, Output Power = 22.03 dBm



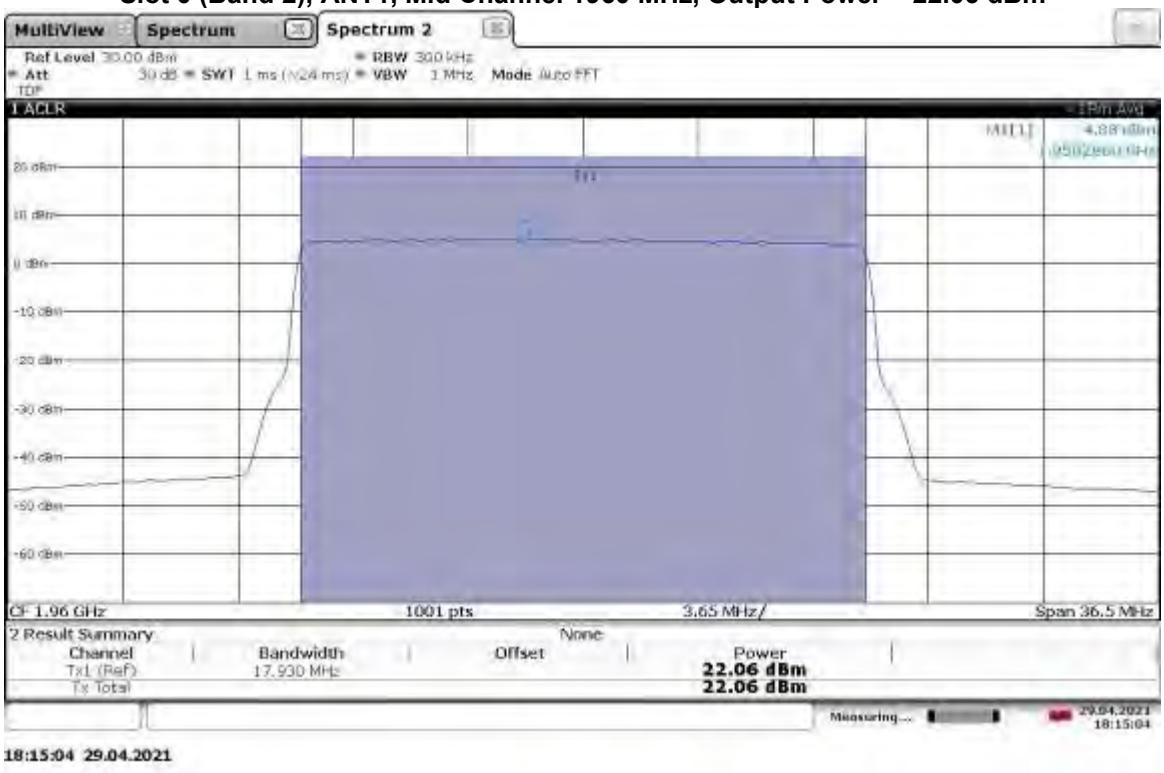
TM3.1-64QAM_20 MHz Bandwidth
Slot 0 (Band 2), ANT1, Low Channel 1940 MHz, Output Power = 22.36 dBm



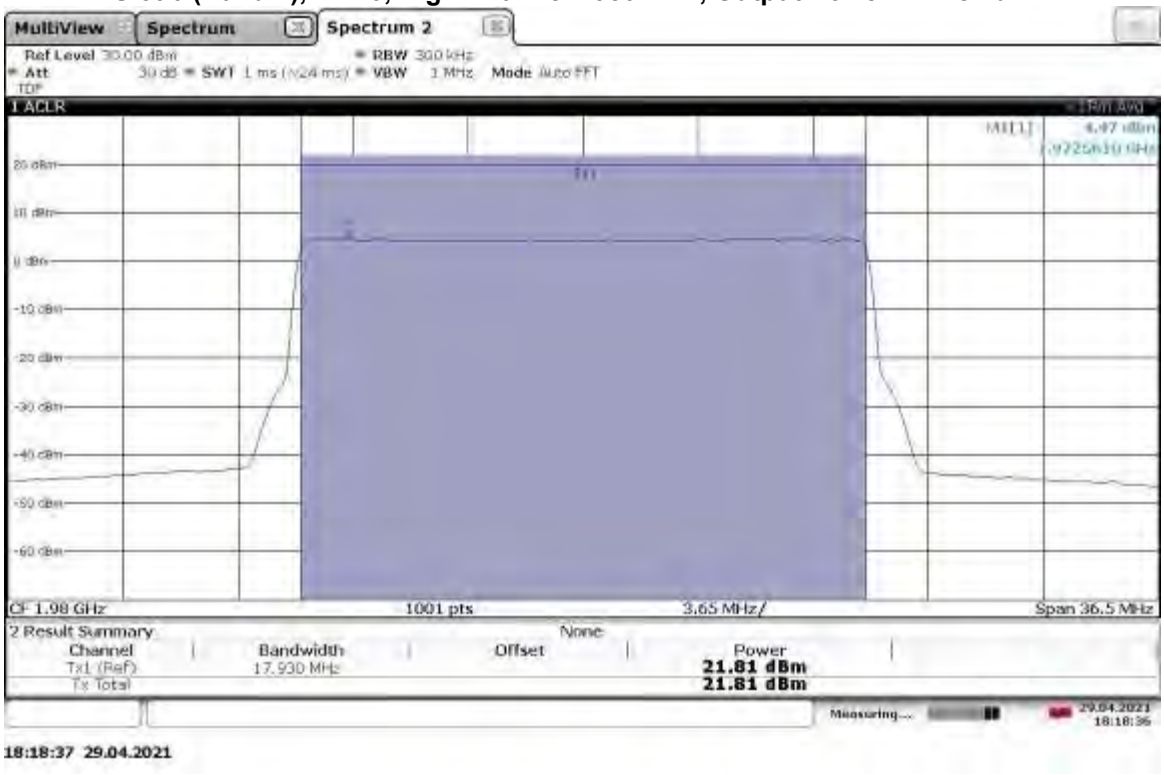
TM3.1-64QAM_20 MHz Bandwidth
Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, Output Power = 21.80 dBm



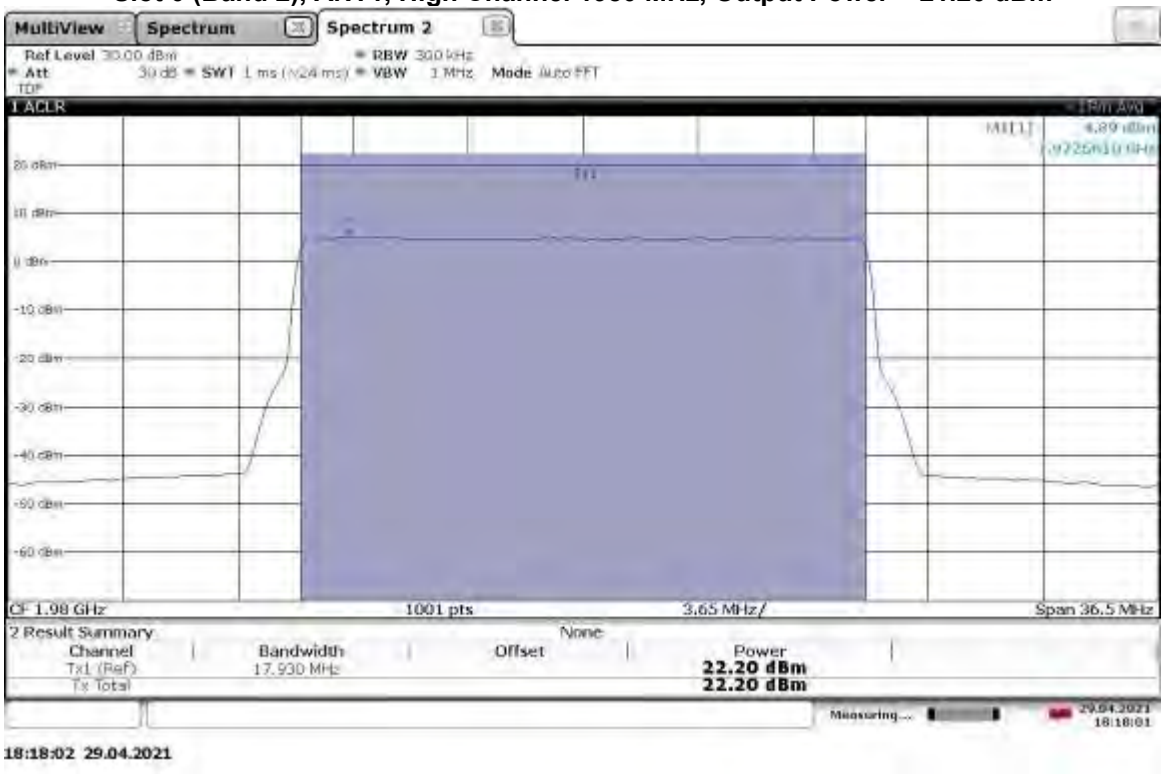
TM3.1-64QAM_20 MHz Bandwidth
Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 22.06 dBm



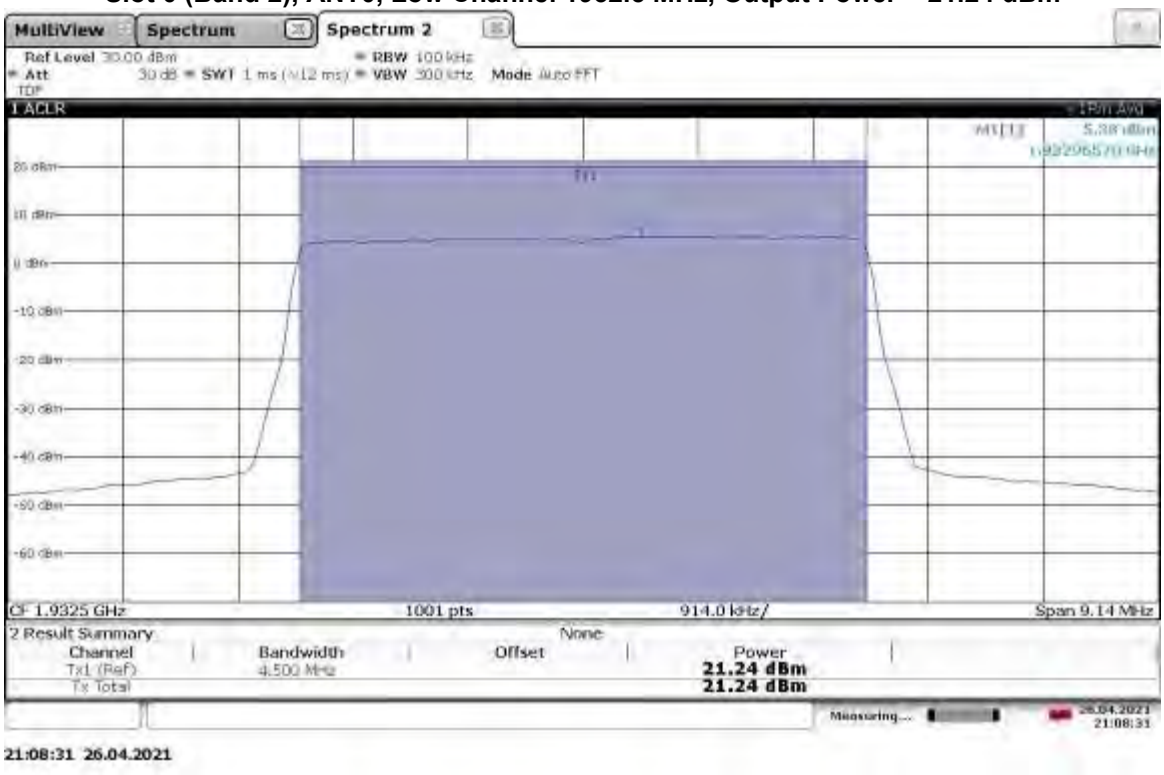
TM3.1-64QAM_20 MHz Bandwidth
Slot 0 (Band 2), ANT0, High Channel 1980 MHz, Output Power = 21.81 dBm



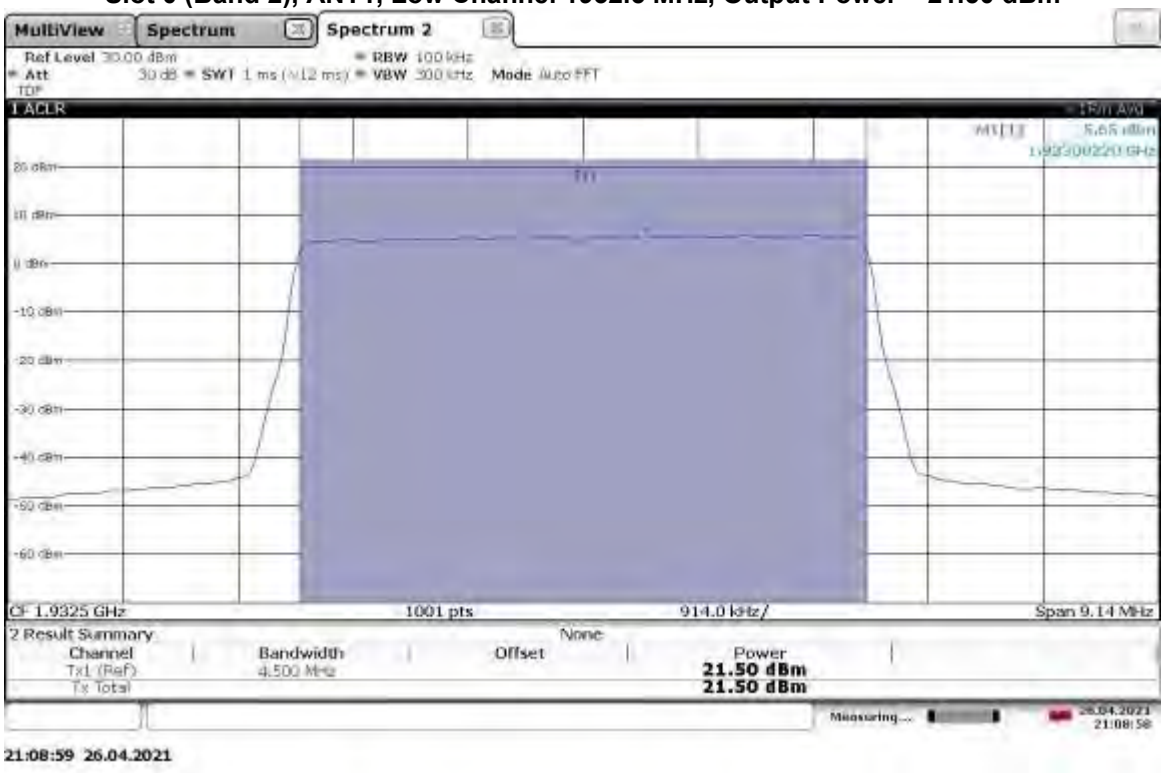
TM3.1-64QAM_20 MHz Bandwidth
Slot 0 (Band 2), ANT1, High Channel 1980 MHz, Output Power = 21.20 dBm



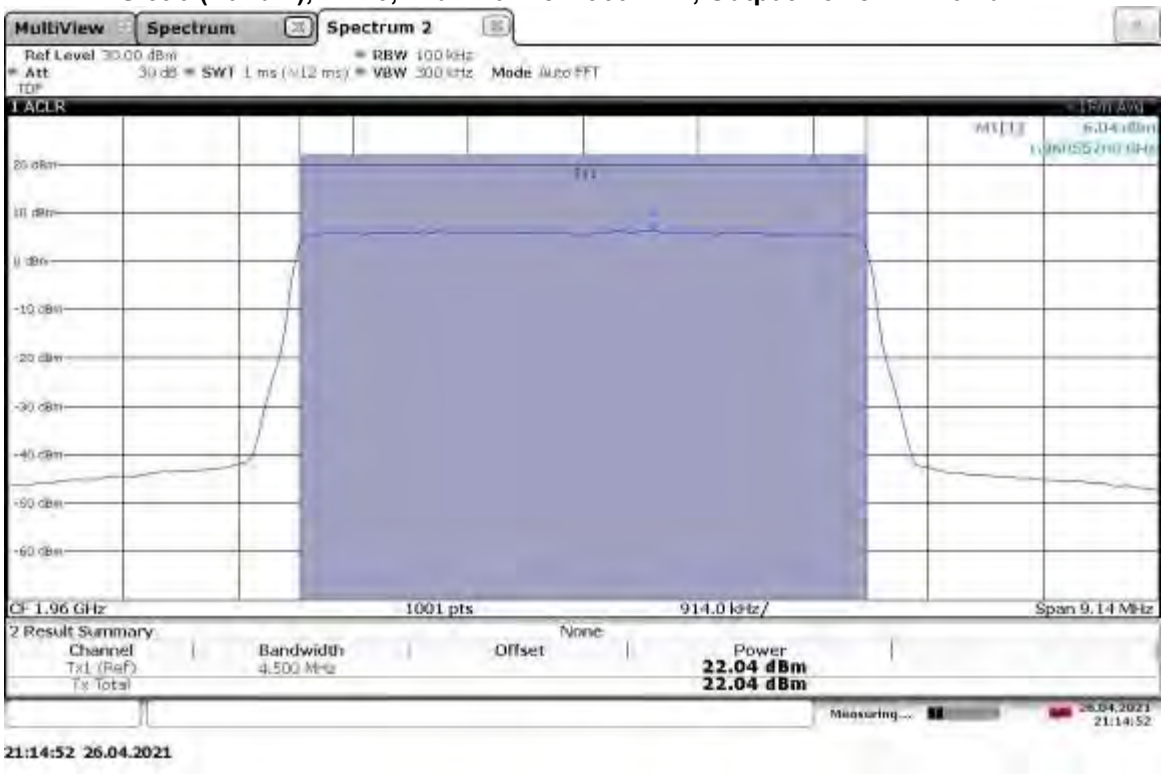
TM3.1a-256QAM _5 MHz Bandwidth
Slot 0 (Band 2), ANT0, Low Channel 1932.5 MHz, Output Power = 21.24 dBm



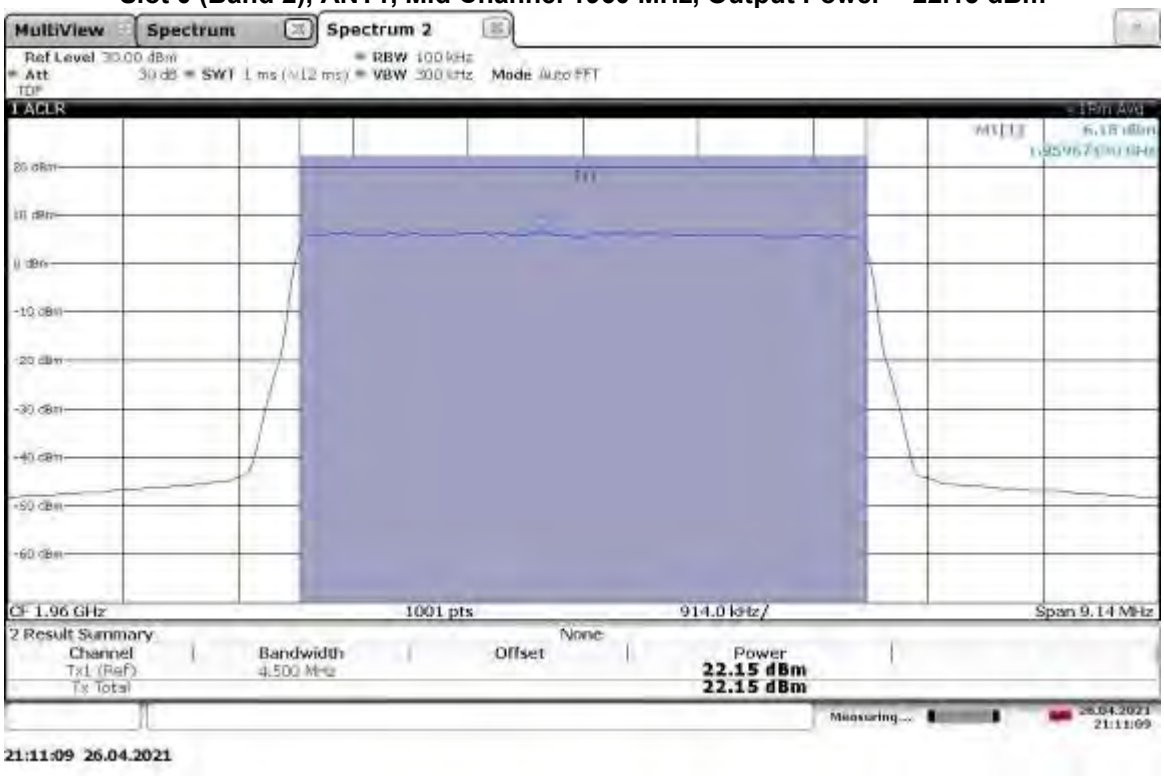
TM3.1a-256QAM _5 MHz Bandwidth
Slot 0 (Band 2), ANT1, Low Channel 1932.5 MHz, Output Power = 21.50 dBm



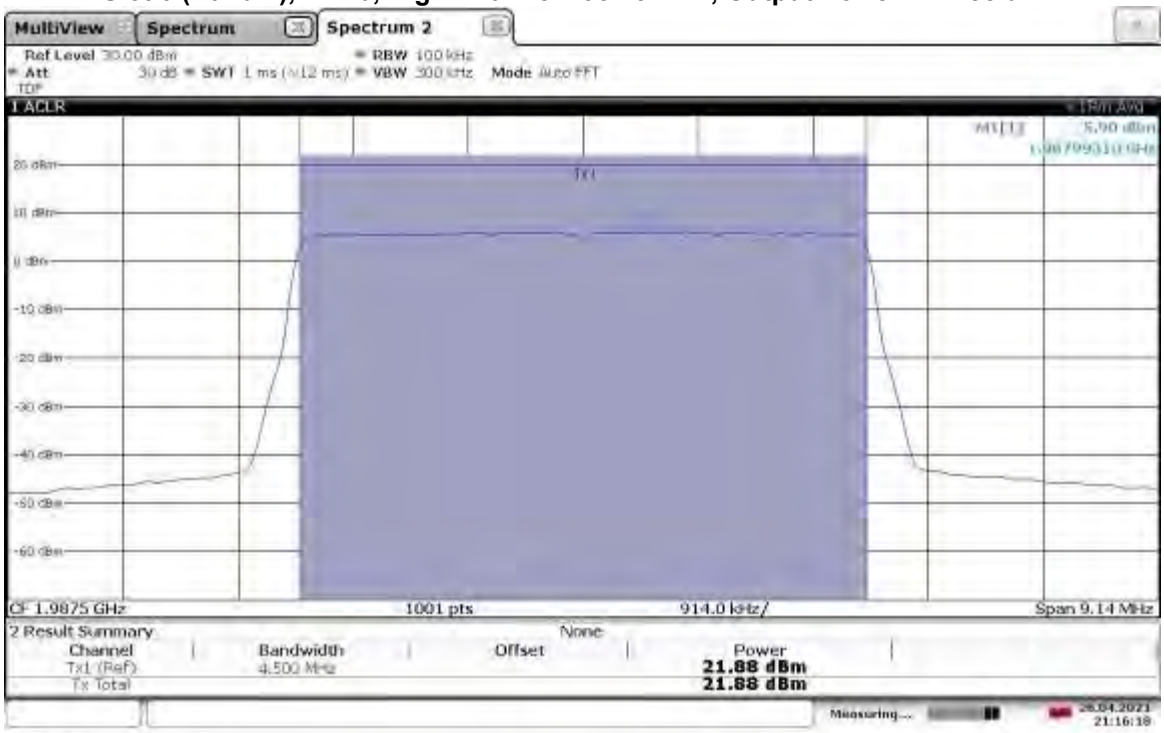
TM3.1a-256QAM _5 MHz Bandwidth
Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, Output Power = 22.04 dBm



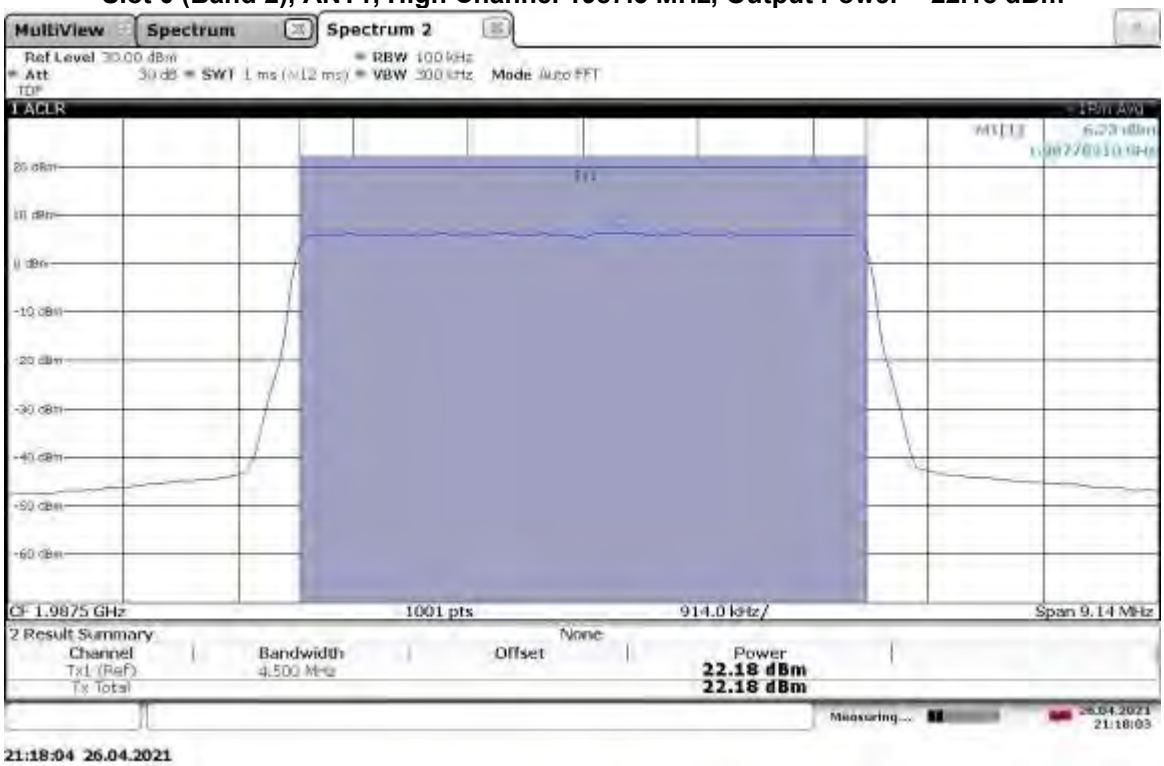
TM3.1a-256QAM _5 MHz Bandwidth
Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 22.15 dBm



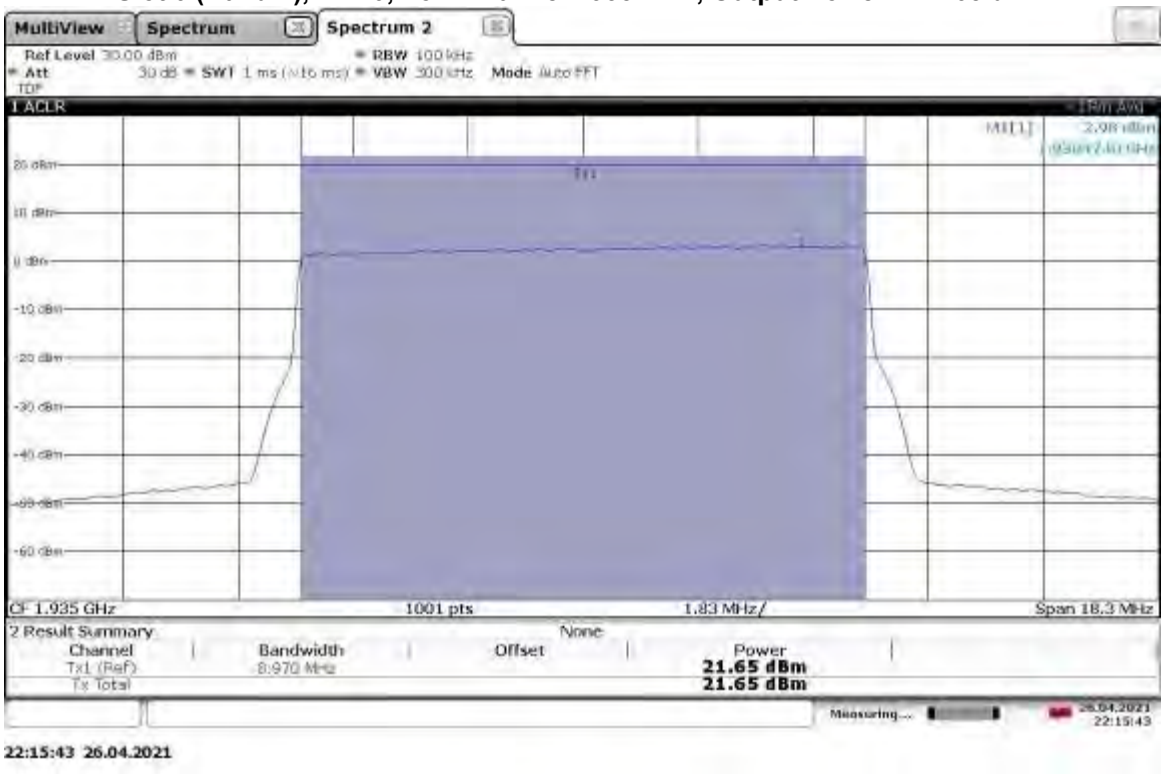
TM3.1a-256QAM _5 MHz Bandwidth
Slot 0 (Band 2), ANT0, High Channel 1987.5 MHz, Output Power = 21.88 dBm



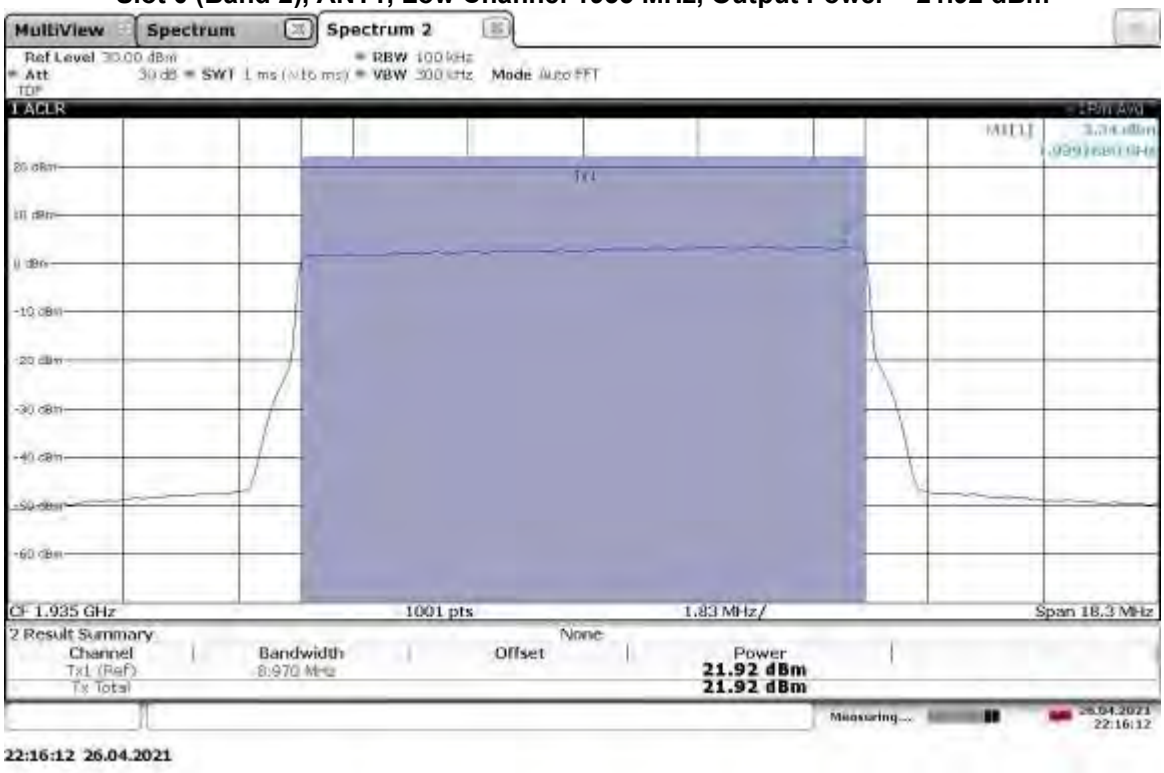
TM3.1a-256QAM _5 MHz Bandwidth
Slot 0 (Band 2), ANT1, High Channel 1987.5 MHz, Output Power = 22.18 dBm



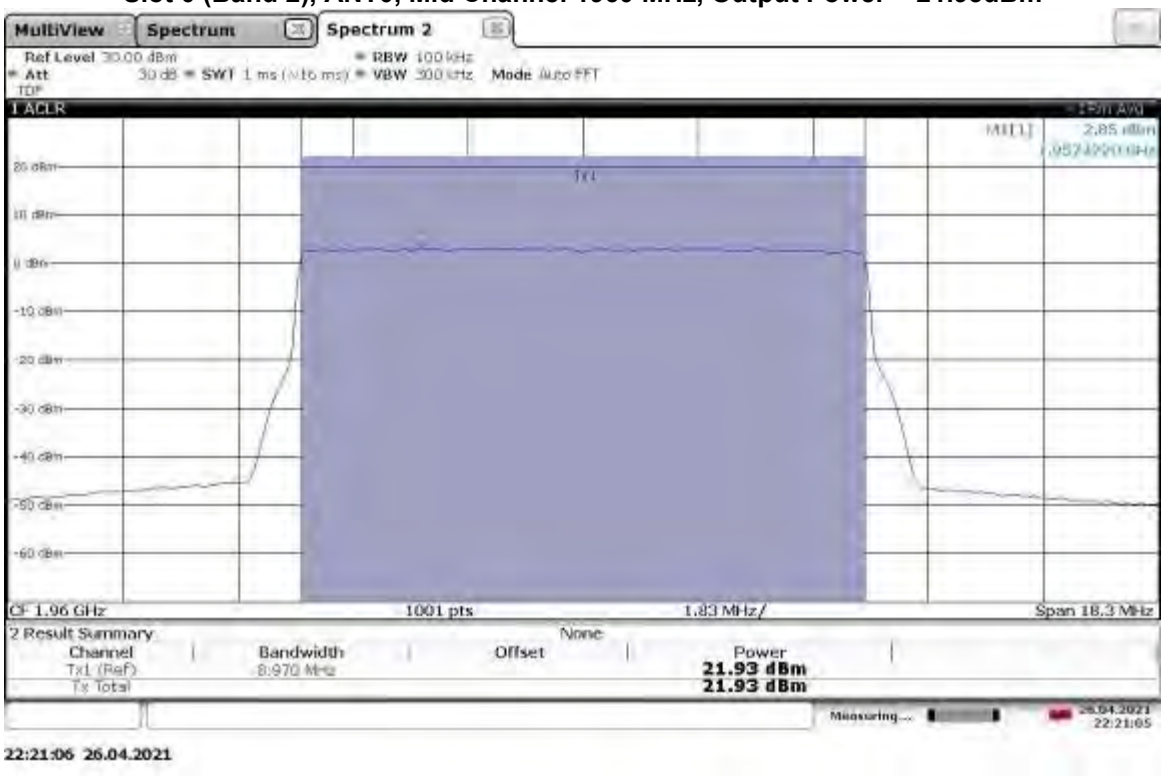
TM3.1a-256QAM _10 MHz Bandwidth
Slot 0 (Band 2), ANT0, Low Channel 1935 MHz, Output Power = 21.65 dBm



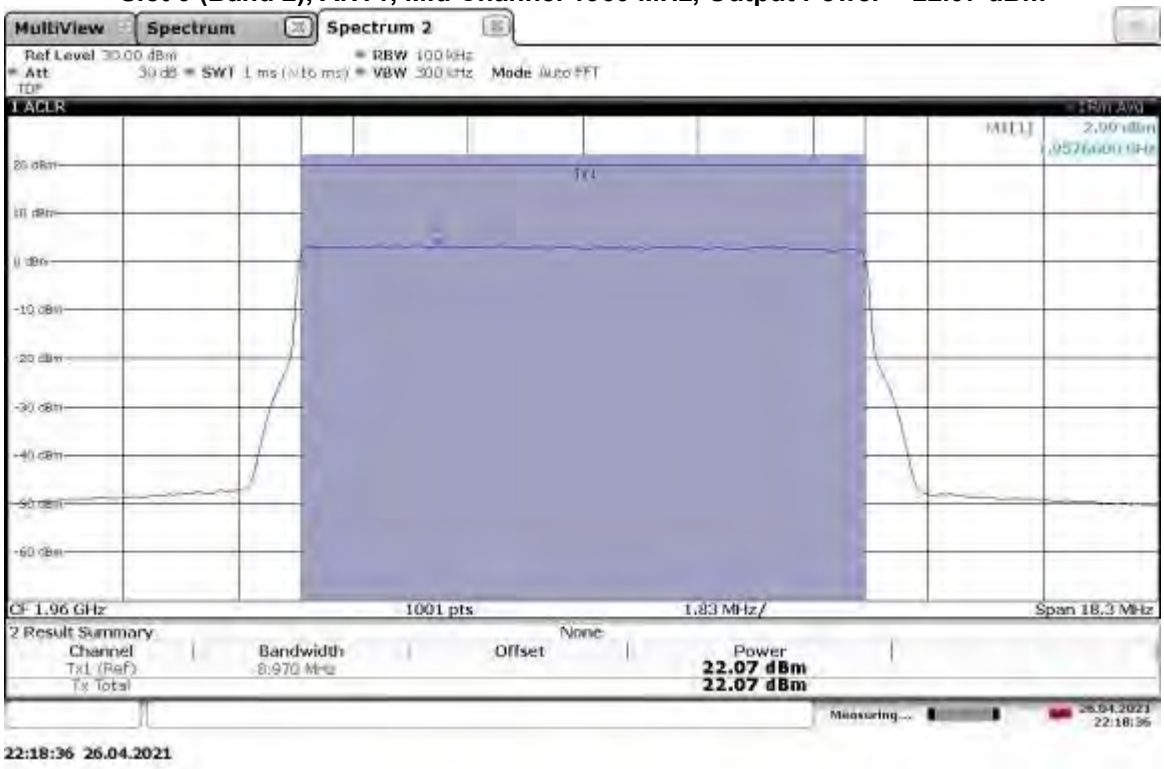
TM3.1a-256QAM _10 MHz Bandwidth
Slot 0 (Band 2), ANT1, Low Channel 1935 MHz, Output Power = 21.92 dBm



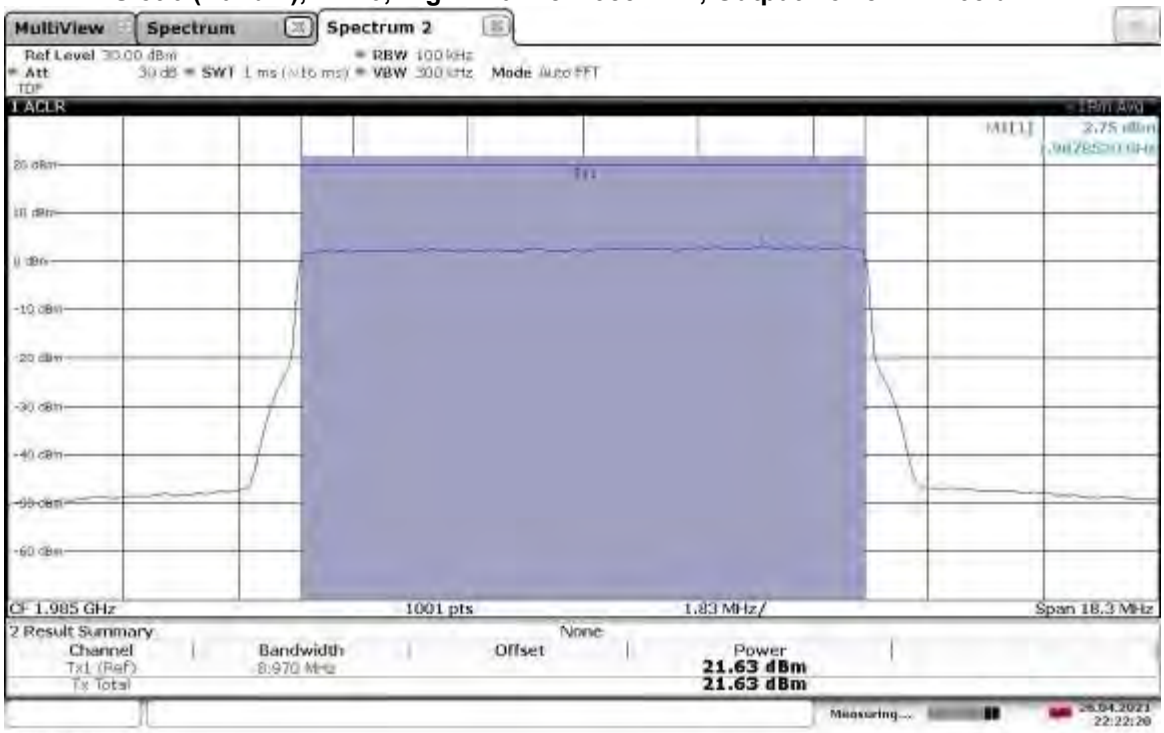
TM3.1a-256QAM _10 MHz Bandwidth
Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, Output Power = 21.93dBm



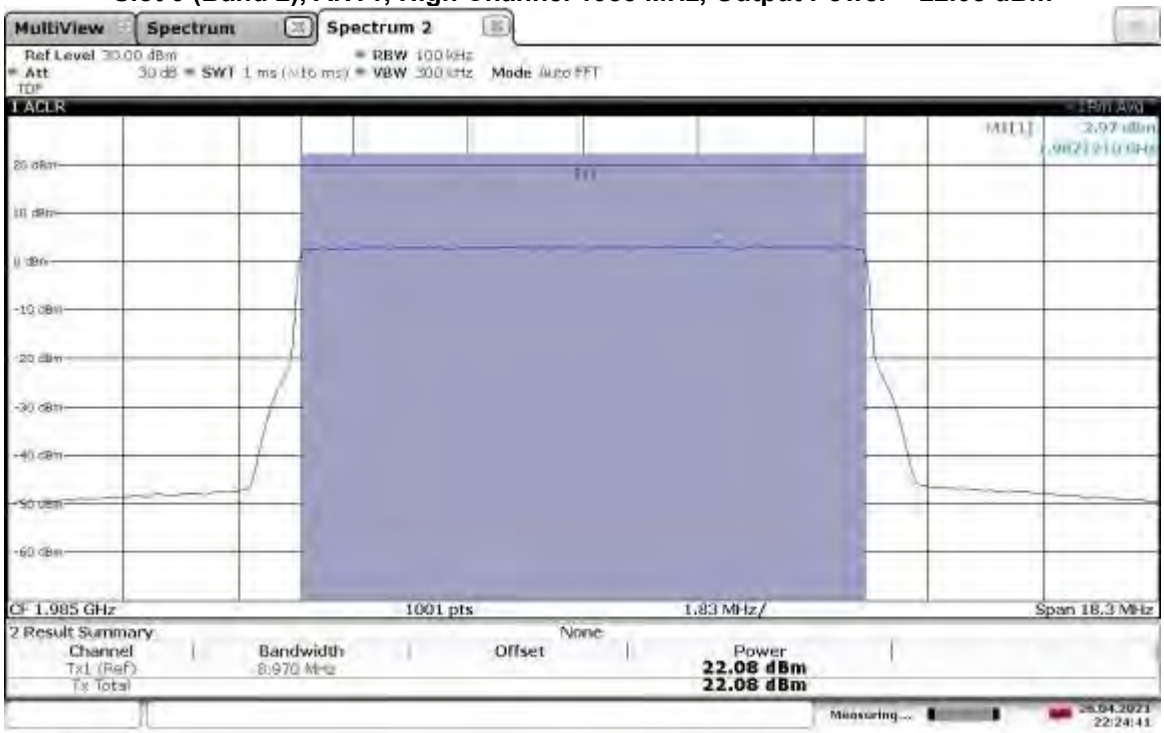
TM3.1a-256QAM _10 MHz Bandwidth
Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 22.07 dBm



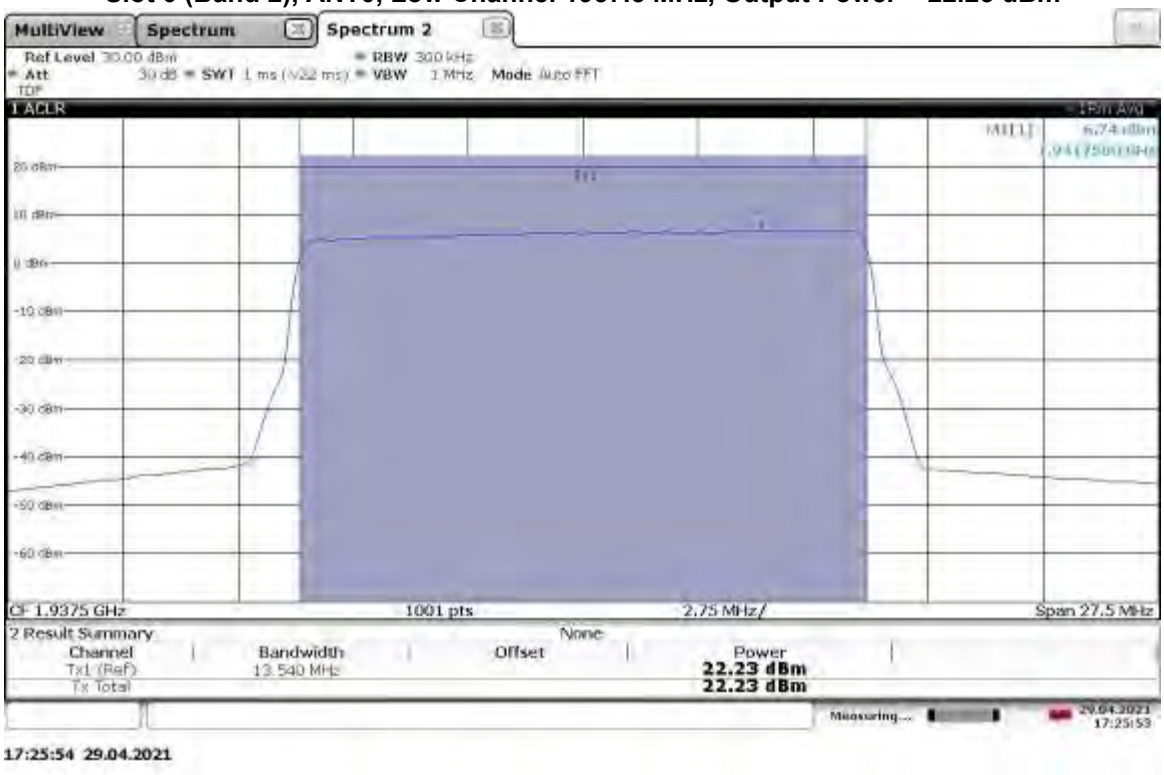
TM3.1a-256QAM _10 MHz Bandwidth
Slot 0 (Band 2), ANT0, High Channel 1985 MHz, Output Power = 21.65 dBm



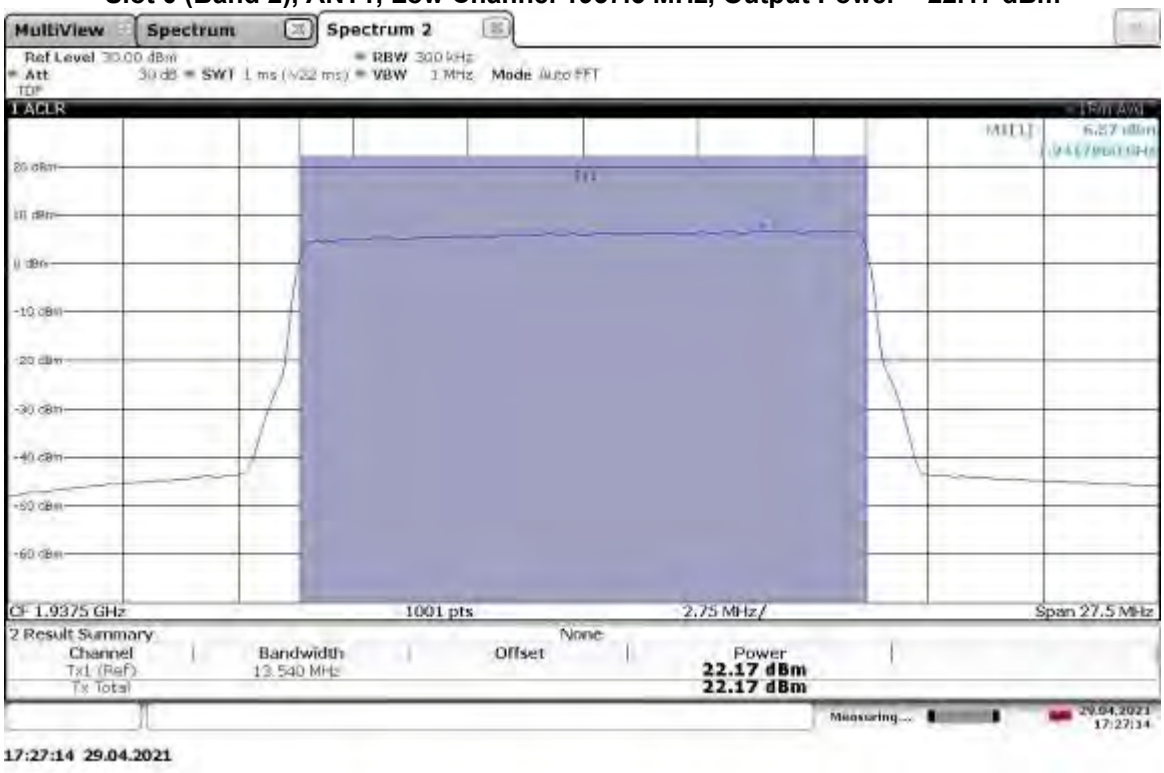
TM3.1a-256QAM _10 MHz Bandwidth
Slot 0 (Band 2), ANT1, High Channel 1985 MHz, Output Power = 22.08 dBm



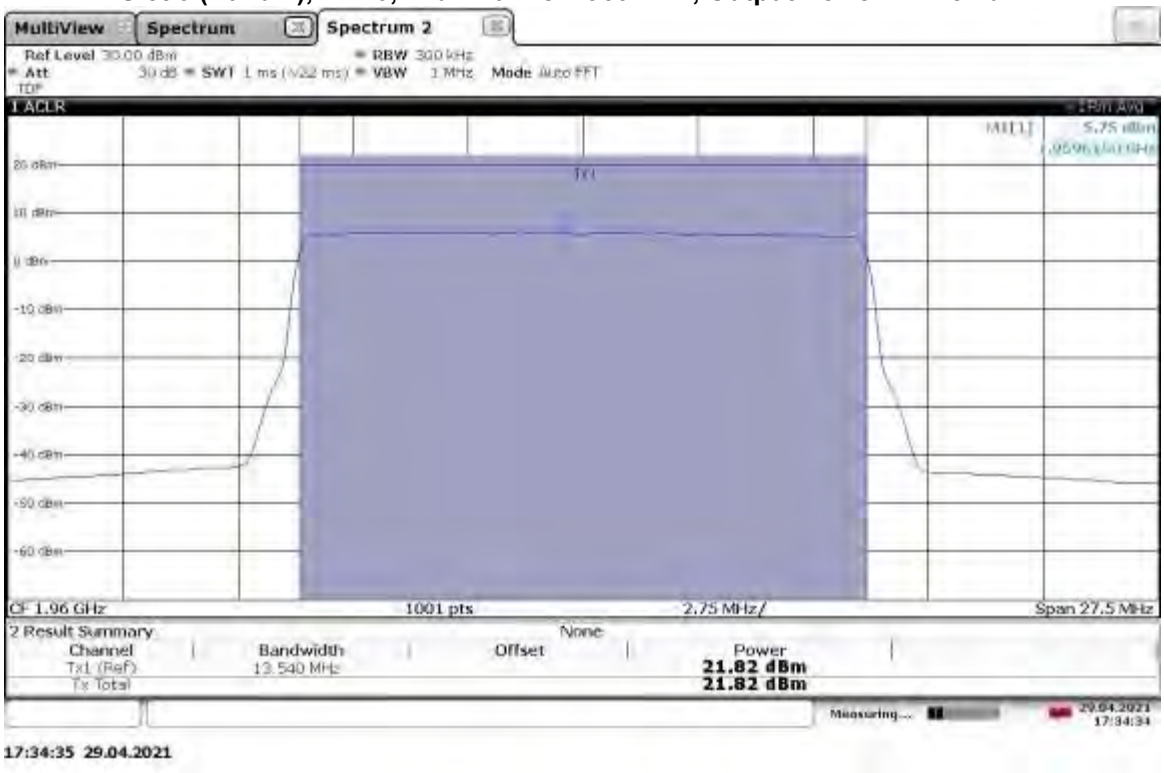
TM3.1a-256QAM _15 MHz Bandwidth
Slot 0 (Band 2), ANT0, Low Channel 1937.5 MHz, Output Power = 22.23 dBm



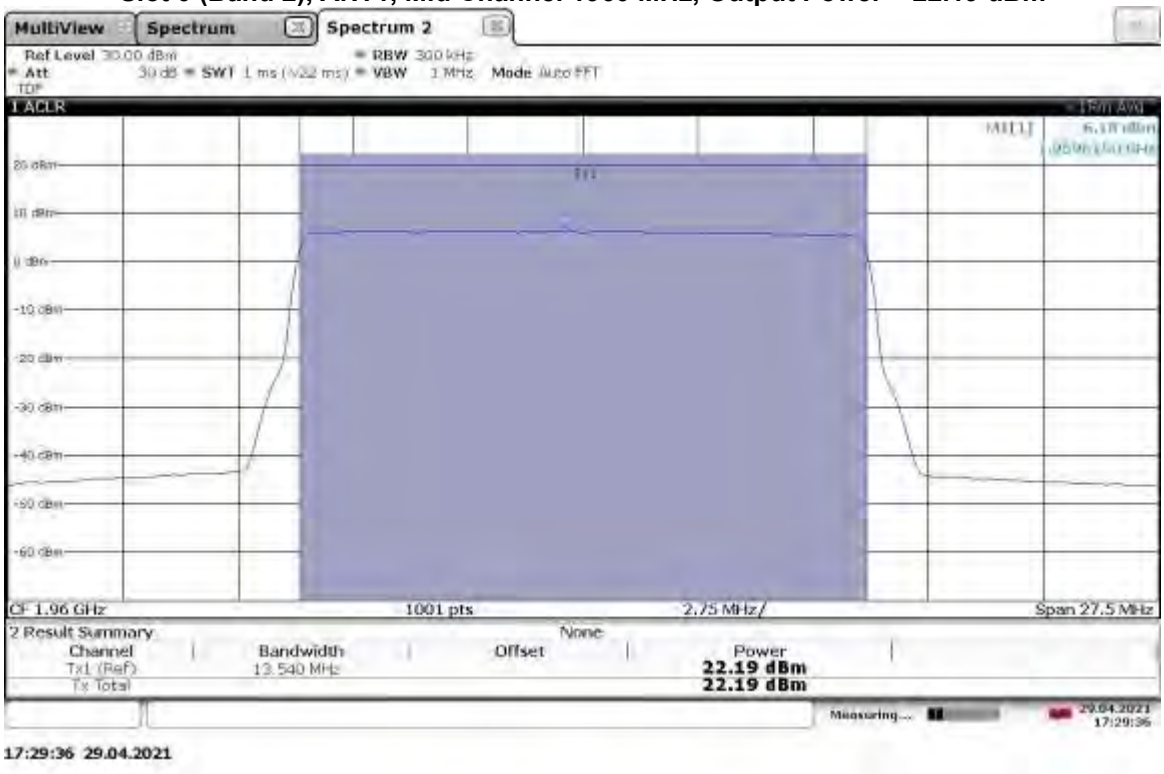
TM3.1a-256QAM _15 MHz Bandwidth
Slot 0 (Band 2), ANT1, Low Channel 1937.5 MHz, Output Power = 22.17 dBm



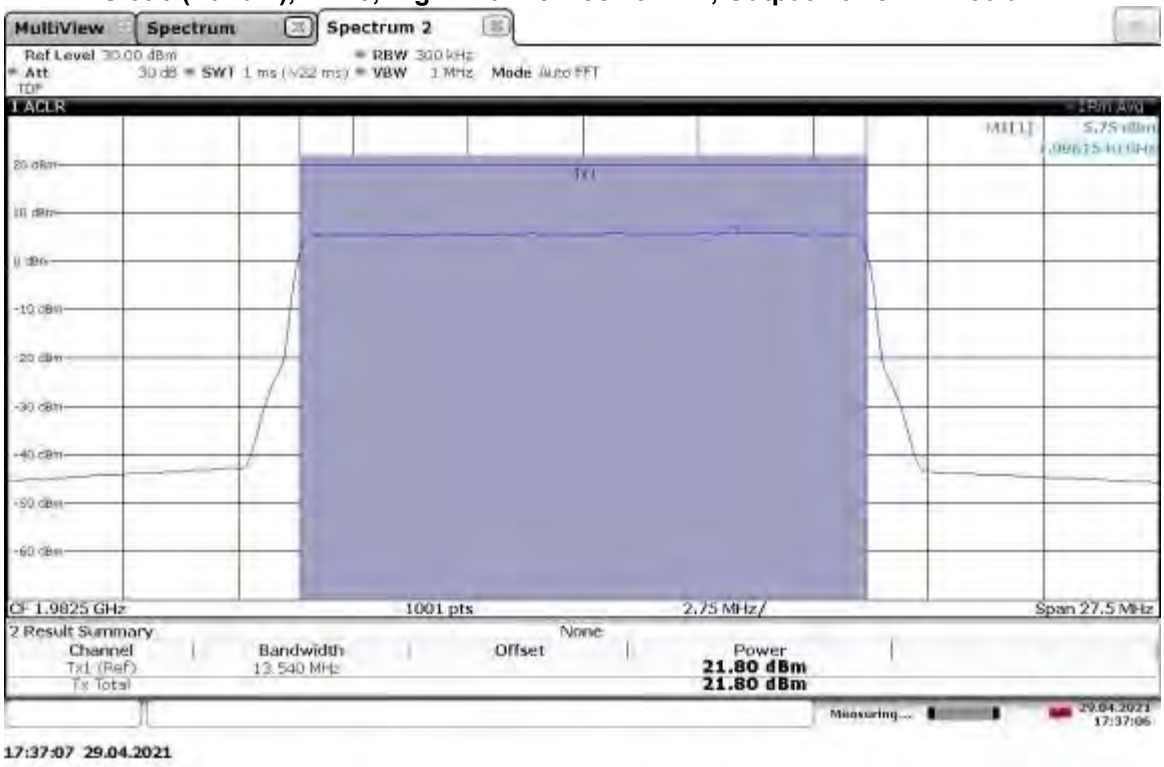
TM3.1a-256QAM _15 MHz Bandwidth
Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, Output Power = 21.82 dBm



TM3.1a-256QAM _15 MHz Bandwidth
Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 22.19 dBm

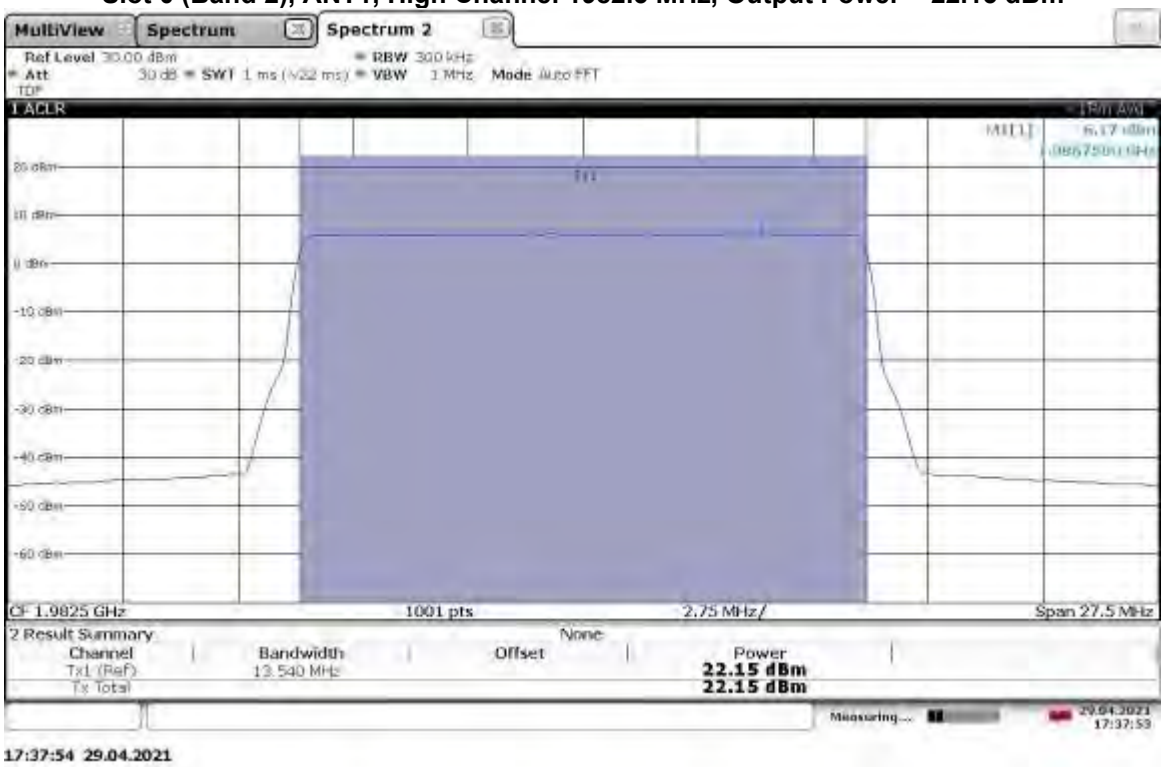


TM3.1a-256QAM _15 MHz Bandwidth
Slot 0 (Band 2), ANT0, High Channel 1982.5 MHz, Output Power = 21.80 dBm



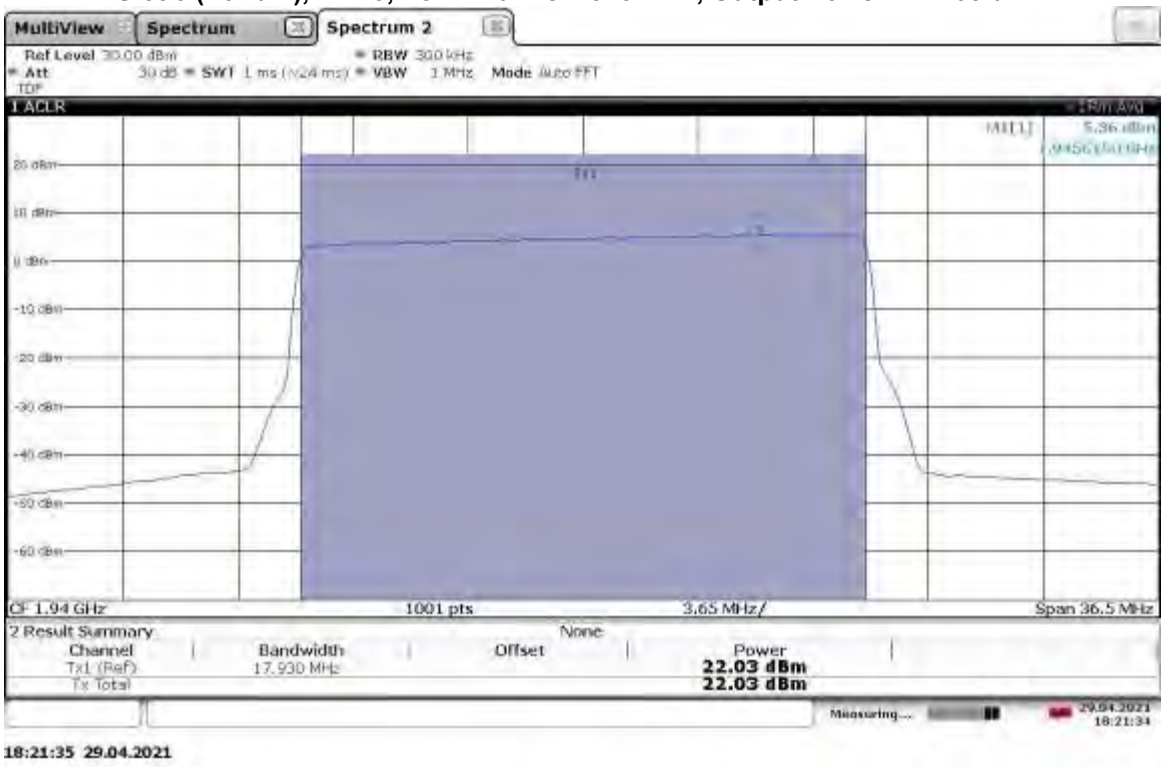
17:37:07 29.04.2021

TM3.1a-256QAM _15 MHz Bandwidth
Slot 0 (Band 2), ANT1, High Channel 1982.5 MHz, Output Power = 22.15 dBm



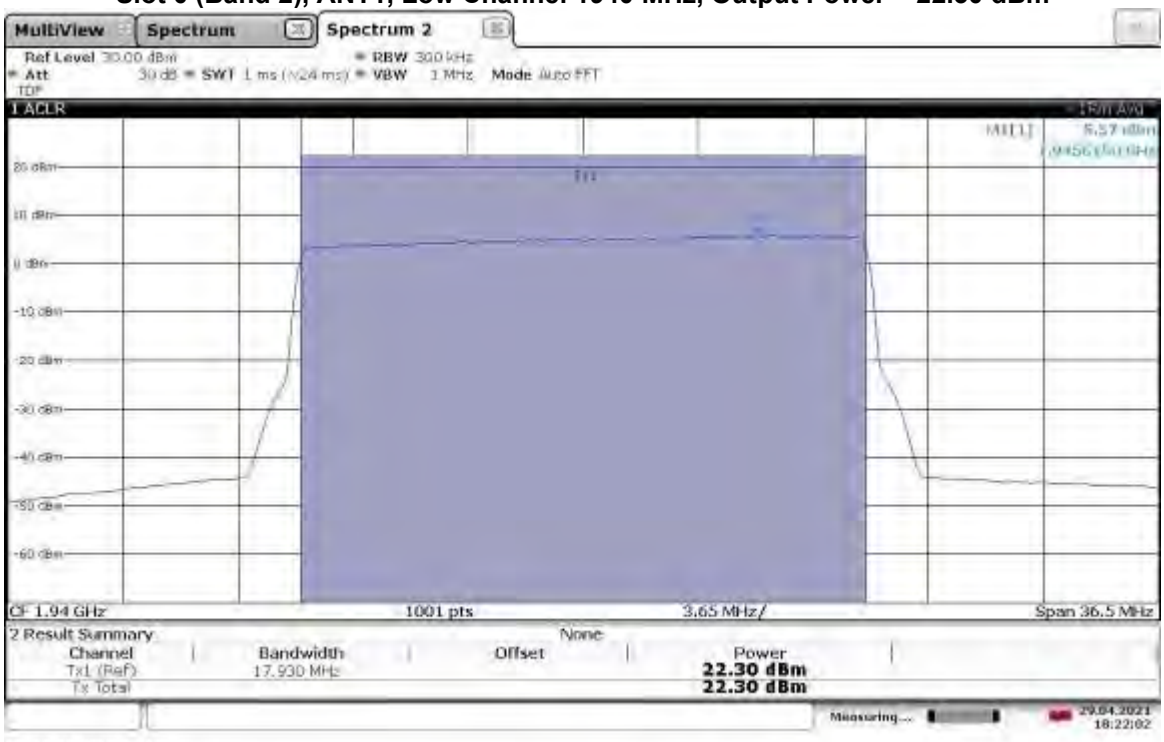
17:37:54 29.04.2021

TM3.1a-256QAM _20 MHz Bandwidth
Slot 0 (Band 2), ANT0, Low Channel 1940 MHz, Output Power = 22.03 dBm



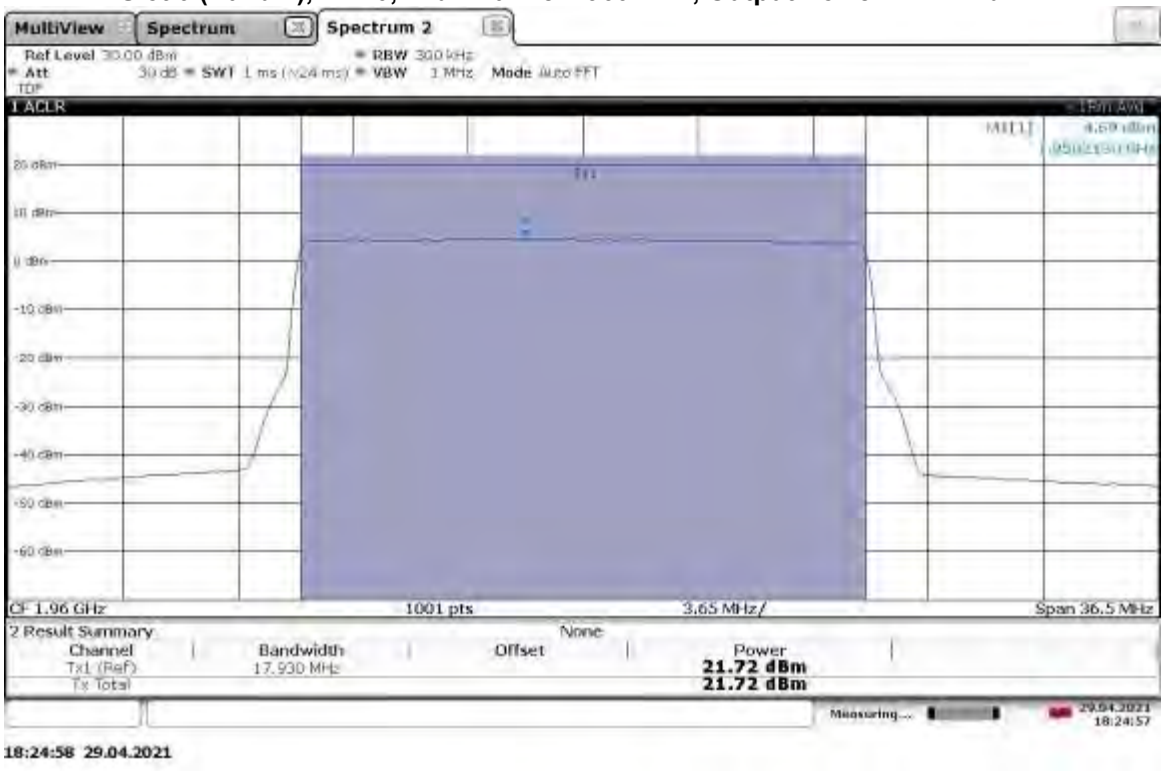
18:21:35 29.04.2021

TM3.1a-256QAM _20 MHz Bandwidth
Slot 0 (Band 2), ANT1, Low Channel 1940 MHz, Output Power = 22.30 dBm

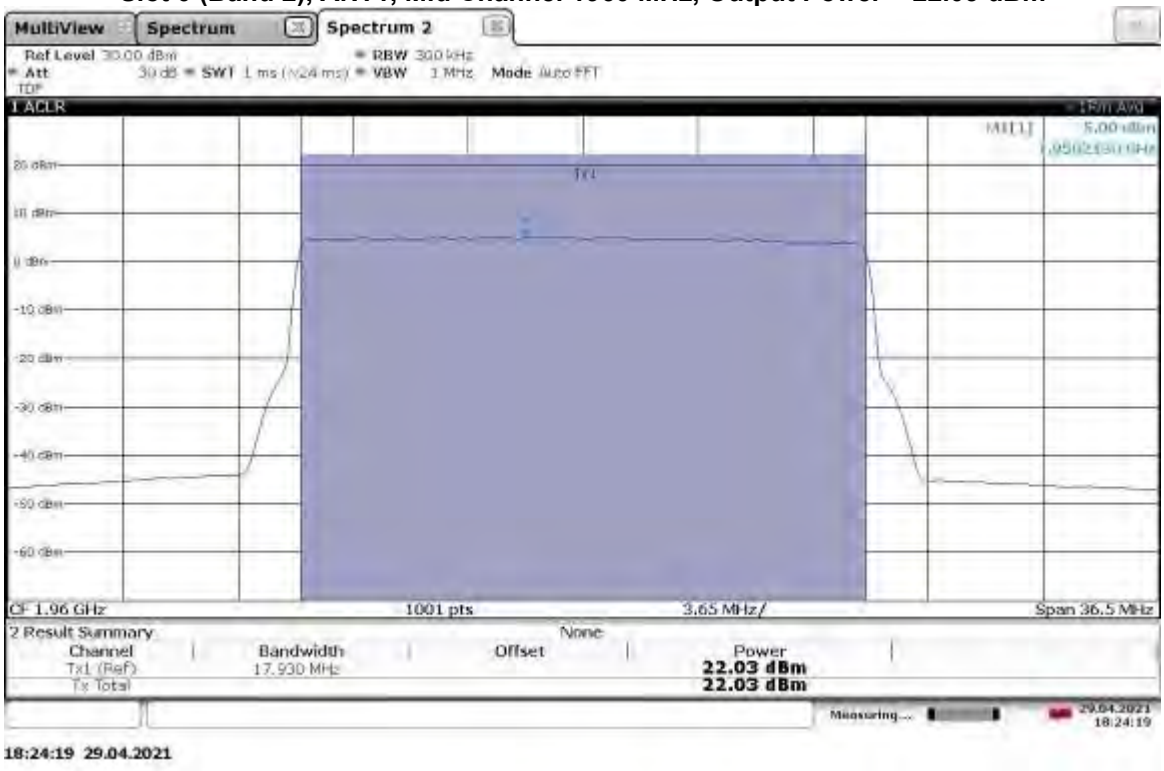


18:22:02 29.04.2021

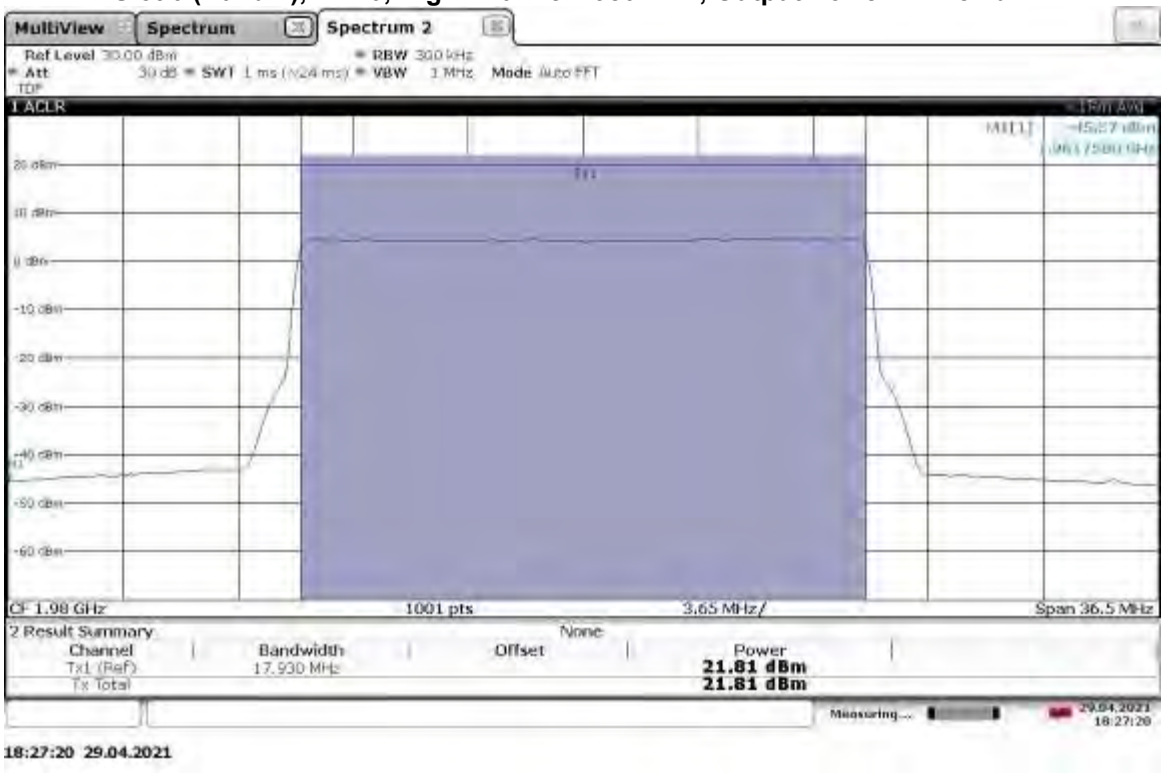
TM3.1a-256QAM _20 MHz Bandwidth
Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, Output Power = 21.72 dBm



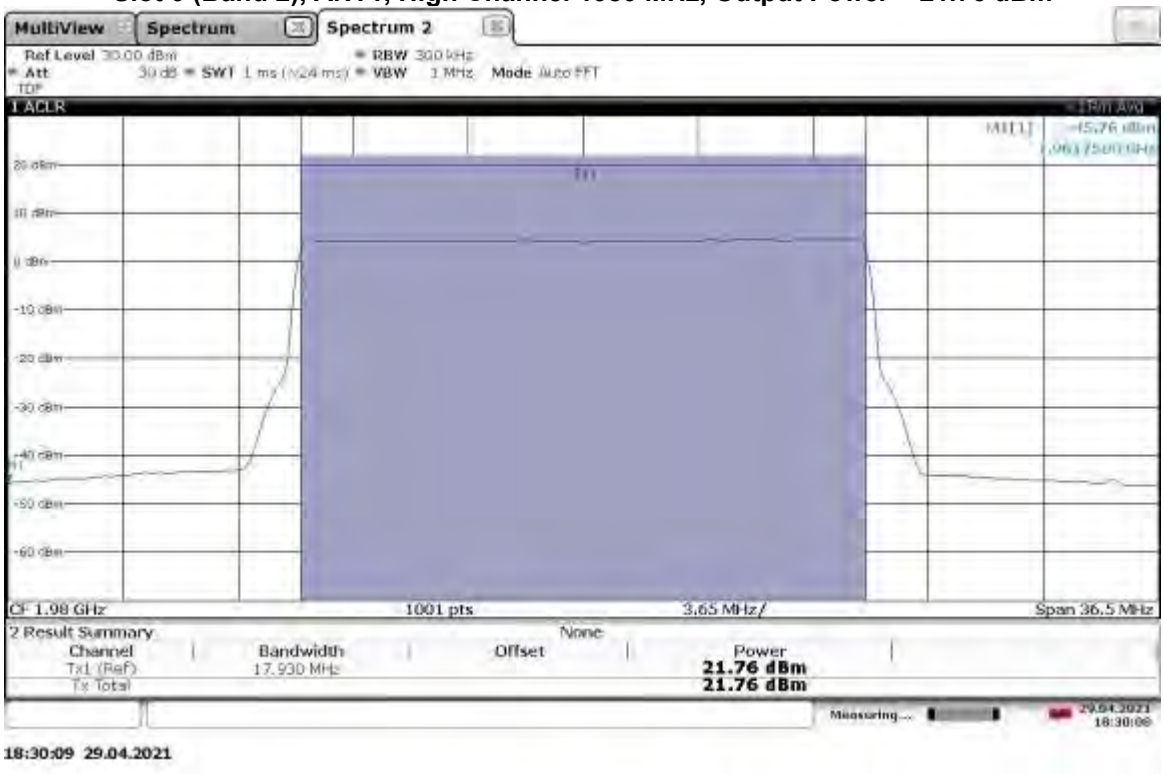
TM3.1a-256QAM _20 MHz Bandwidth
Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 22.03 dBm



TM3.1a-256QAM _20 MHz Bandwidth
Slot 0 (Band 2), ANT0, High Channel 1980 MHz, Output Power = 21.81 dBm



TM3.1a-256QAM _20 MHz Bandwidth
Slot 0 (Band 2), ANT1, High Channel 1980 MHz, Output Power = 21.76 dBm



Limit for Maximum Permissible Exposure (MPE)

FCC Human RF Exposure Limits:

The FCC §1.1310 The criteria listed in table 1 was used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices shall be evaluated according to the provisions of §2.1093 of this chapter.

Part §1.1310 Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	$*900/f^2$	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	$*180/f^2$	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz * = Plane-wave equivalent power density

(1) Occupational/controlled exposure limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when a person is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure. The phrase *fully aware* in the context of applying these exposure limits means that an exposed person has received written and/or verbal information fully explaining the potential for RF exposure resulting from his or her employment. With the exception of *transient* persons, this phrase also means that an exposed person has received appropriate training regarding work practices relating to controlling or mitigating his or her exposure. Such training is not required for *transient* persons, but they must receive written and/or verbal information and notification (for example, using signs) concerning their exposure potential and appropriate means available to mitigate their exposure. The phrase *exercise control* means that an exposed person is allowed to and knows how to reduce or avoid exposure by administrative or engineering controls and work practices, such as use of personal protective equipment or time averaging of exposure.

(2) General population/uncontrolled exposure limits apply in situations in which the general public may be exposed, or in which persons who are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

Test Procedure

RF exposure for licensed transmitter is handled at the time of licensing, however, an MPE calculation was performed in order to show the distance at which the device is compliant with the limits of §1.1310, assuming antenna gains of 0 dBi and 4 dBi. The highest measured conducted output power was used, adjusted by +3dB to account for two antenna MIMO operation.

FCC Limit For General Population/Uncontrolled Exposure at 1.9375 GHz = 1 mW/cm^2

Power Density = [EIRP] / [4π x $(D_{cm})^2$]

Where EIRP is in milliwatts and D is in centimeters. Setting the power density equal to the limit of 1 mW/cm^2 and solving for D_{cm} yields the following results.

Results:
EUT EIRP = Conducted power + Array Gain + Antenna gain in dBi

Power Density Limit = [EIRP] / [4π x $(D_{cm})^2$]
1 mW/cm^2 = [EIRP] / [4π x $(D_{cm})^2$]
D_{cm} = ([EIRP] / [4π])$^{1/2}$

For Gain = 0 dBi,
EIRP = 22.85 dBm + 10*LOG(2) + 0 dBi = 22.85 dBm + 3 dB + 0dBi
EIRP = 25.85 dBm or 384.59 mW
Therefore, the minimum safe distance D_{cm} is D_{cm} = ([384.59] / [4π])$^{1/2}$
D_{cm} = 5.532 cm at 0 dBi gain two antenna MIMO

For Gain = 4 dBi,
EIRP = 22.85 dBm + 10*LOG(2) + 4 dBi = 22.85 dBm + 3 dB + 4dBi
EIRP = 29.85 dBm or 966.05 mW
Therefore, the minimum safe distance D_{cm} is D_{cm} = ([966.05] / [4π])$^{1/2}$
D_{cm} = 8.77 cm at 4 dBi gain two antenna MIMO

For Gain = X dBi,
EIRP = 22.85 dBm + 10*LOG(2) + X dBi = 22.85 dBm + 3 dB + XdBi
EIRP = 25.85+X dBm or 384.59 + 10^(X/10) mW
Therefore, the minimum safe distance D_{cm} is D_{cm} = ([384.59 + 10^(X/10)] / [4π])$^{1/2}$
D_{cm} = 0.282 * (384.59 + 10^(X/10))$^{1/2}$ cm at X dBi gain two antenna MIMO

Test Personnel:	Vathana Ven VSV	Test Date:	04/26/2021 04/29/2021
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	FCC Part 24	Limit Applied:	See report section 6.3
Input Voltage:	48 VDC (POE)		
Pretest Verification w/ Ambient Signals or BB Source:	N/A	Ambient Temperature:	22, 23 ºC
		Relative Humidity:	21, 15 %
		Atmospheric Pressure:	1004, 1013 mbars

Deviations, Additions, or Exclusions: None

7 Occupied Bandwidth

7.1 Method

Tests are performed in accordance with ANSI C63.26 and CFR47 FCC Parts 2.1049 and 24.

TEST SITE: EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 400, and 480 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

7.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
CEN001'	DC-40GHz attenuator 20dB	Centric RF	C411-20	CEN001	02/22/2021	01/22/2022
CBLHF2012-2M-2	2m 9kHz-40GHz Coaxial Cable - SET1	Huber & Suhner	SF102	252676002	02/19/2021	02/19/2022
ROS005-1'	Signal and Spectrum Analyzer	Rohde & Schwarz	FSW43	100646	10/27/2020	10/27/2021
DAV005	Weather Station Vantage Vue	Davis	6250	MS191218083	02/07/2021	02/07/2022

Software Utilized:

Name	Manufacturer	Version
None	--	--

7.3 Results:

The sample tested was found to Comply.

§2.1049: The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

Slot 0 (Band 2), Bandwidth: 5 MHz, Modulation: TM1.1-QPSK

Channel	Frequency (MHz)	Antenna Port	Occupied BW (MHz)
Low	1932.50	ANT0	4.497
		ANT1	4.496
Mid	1960.00	ANT0	4.496
		ANT1	4.497
High	1987.50	ANT0	4.497
		ANT1	4.497

Slot 0 (Band 2), Bandwidth: 10 MHz, Modulation: TM1.1-QPSK

Channel	Frequency (MHz)	Antenna Port	Occupied BW (MHz)
Low	1935.00	ANT0	8.970
		ANT1	8.970
Mid	1960.00	ANT0	8.974
		ANT1	8.960
High	1985.00	ANT0	8.978
		ANT1	8.979

Slot 0 (Band 2), Bandwidth: 15 MHz, Modulation: TM1.1-QPSK

Channel	Frequency (MHz)	Antenna Port	Occupied BW (MHz)
Low	1937.50	ANT0	13.537
		ANT1	13.537
Mid	1960.00	ANT0	13.529
		ANT1	13.540
High	1982.50	ANT0	13.563
		ANT1	13.551

Slot 0 (Band 2), Bandwidth: 20 MHz, Modulation: TM1.1-QPSK

Channel	Frequency (MHz)	Antenna Port	Occupied BW (MHz)
Low	1940.00	ANT0	17.931
		ANT1	17.935
Mid	1960.00	ANT0	17.941
		ANT1	17.939
High	1980.00	ANT0	17.983
		ANT1	17.987

Slot 0 (Band 2), Bandwidth: 5 MHz, Modulation: TM3.2-16QAM

Channel	Frequency (MHz)	Antenna Port	Occupied BW (MHz)
Low	1932.50	ANT0	4.488
		ANT1	4.488
Mid	1960.00	ANT0	4.486
		ANT1	4.490
High	1987.50	ANT0	4.488
		ANT1	4.484

Slot 0 (Band 2), Bandwidth: 10 MHz, Modulation: TM3.2-16QAM

Channel	Frequency (MHz)	Antenna Port	Occupied BW (MHz)
Low	1935.00	ANT0	8.957
		ANT1	8.945
Mid	1960.00	ANT0	8.953
		ANT1	8.956
High	1985.00	ANT0	8.960
		ANT1	8.963

Slot 0 (Band 2), Bandwidth: 15 MHz, Modulation: TM3.2-16QAM

Channel	Frequency (MHz)	Antenna Port	Occupied BW (MHz)
Low	1937.50	ANT0	13.492
		ANT1	13.474
Mid	1960.00	ANT0	13.486
		ANT1	13.443
High	1982.50	ANT0	13.514
		ANT1	13.499

Slot 0 (Band 2), Bandwidth: 20 MHz, Modulation: TM3.2-16QAM

Channel	Frequency (MHz)	Antenna Port	Occupied BW (MHz)
Low	1940.00	ANT0	17.949
		ANT1	17.950
Mid	1960.00	ANT0	17.906
		ANT1	17.912
High	1980.00	ANT0	17.946
		ANT1	17.958

Slot 0 (Band 2), Bandwidth: 5 MHz, Modulation: TM3.1-64QAM

Channel	Frequency (MHz)	Antenna Port	Occupied BW (MHz)
Low	1932.50	ANT0	4.530
		ANT1	4.529
Mid	1960.00	ANT0	4.532
		ANT1	4.533
High	1987.50	ANT0	4.532
		ANT1	4.532

Slot 0 (Band 2), Bandwidth: 10 MHz, Modulation: TM3.1-64QAM

Channel	Frequency (MHz)	Antenna Port	Occupied BW (MHz)
Low	1935.00	ANT0	8.984
		ANT1	8.983
Mid	1960.00	ANT0	8.982
		ANT1	8.985
High	1985.00	ANT0	8.984
		ANT1	8.986

Slot 0 (Band 2), Bandwidth: 15 MHz, Modulation: TM3.1-64QAM

Channel	Frequency (MHz)	Antenna Port	Occupied BW (MHz)
Low	1937.50	ANT0	13.534
		ANT1	13.549
Mid	1960.00	ANT0	13.559
		ANT1	13.560
High	1982.50	ANT0	13.585
		ANT1	13.576

Slot 0 (Band 2), Bandwidth: 20 MHz, Modulation: TM3.1-64QAM

Channel	Frequency (MHz)	Antenna Port	Occupied BW (MHz)
Low	1940.00	ANT0	17.900
		ANT1	17.913
Mid	1960.00	ANT0	17.924
		ANT1	17.930
High	1980.00	ANT0	17.955
		ANT1	17.967

Slot 0 (Band 2), Bandwidth: 5 MHz, Modulation: TM3.1a-256QAM_

Channel	Frequency (MHz)	Antenna Port	Occupied BW (MHz)
Low	1932.50	ANT0	4.516
		ANT1	4.516
Mid	1960.00	ANT0	4.515
		ANT1	4.515
High	1987.50	ANT0	4.515
		ANT1	4.514

Slot 0 (Band 2), Bandwidth: 10 MHz, Modulation: TM3.1a-256QAM_

Channel	Frequency (MHz)	Antenna Port	Occupied BW (MHz)
Low	1935.00	ANT0	8.969
		ANT1	8.970
Mid	1960.00	ANT0	8.961
		ANT1	8.961
High	1985.00	ANT0	8.973
		ANT1	8.968

Slot 0 (Band 2), Bandwidth: 15 MHz, Modulation: TM3.1a-256QAM

Channel	Frequency (MHz)	Antenna Port	Occupied BW (MHz)
Low	1937.500	ANT0	13.529
		ANT1	13.542
Mid	1960.00	ANT0	13.536
		ANT1	13.515
High	1982.50	ANT0	13.564
		ANT1	13.550

Slot 0 (Band 2), Bandwidth: 20 MHz, Modulation: TM3.1a-256QAM

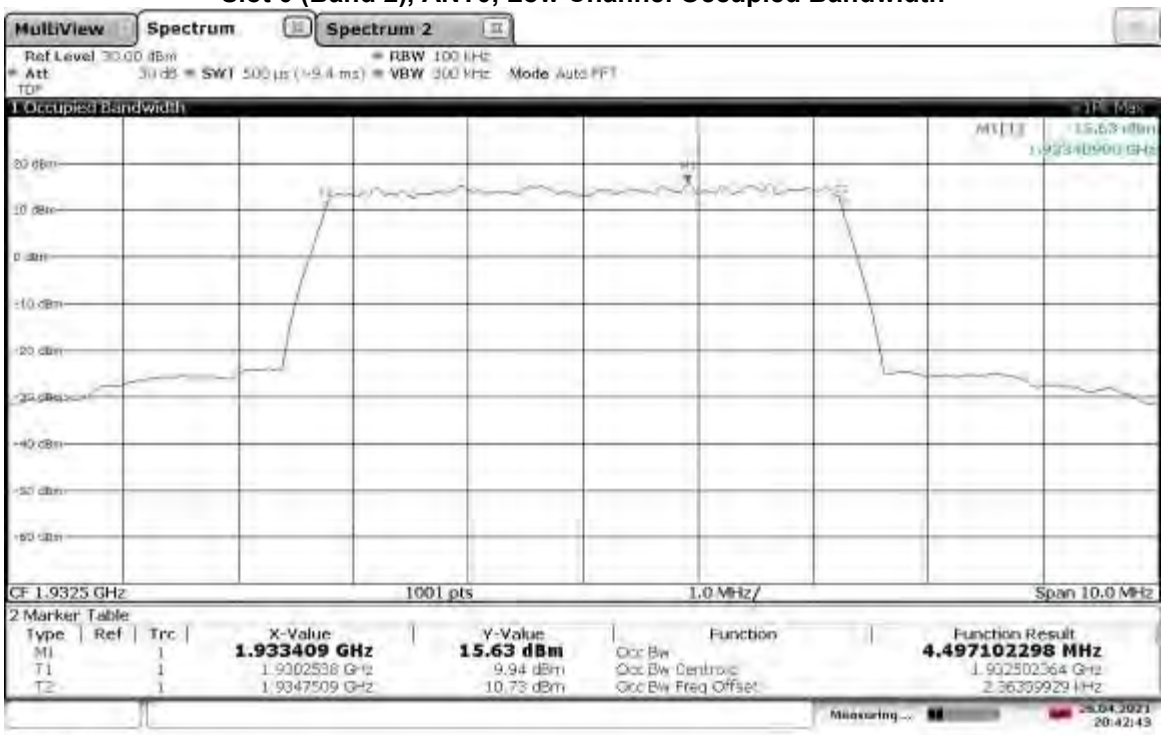
Channel	Frequency (MHz)	Antenna Port	Occupied BW (MHz)
Low	1940	ANT0	17.956
		ANT1	17.926
Mid	1960	ANT0	17.942
		ANT1	17.960
High	1980	ANT0	17.999
		ANT1	18.017

7.4 Setup Photograph:

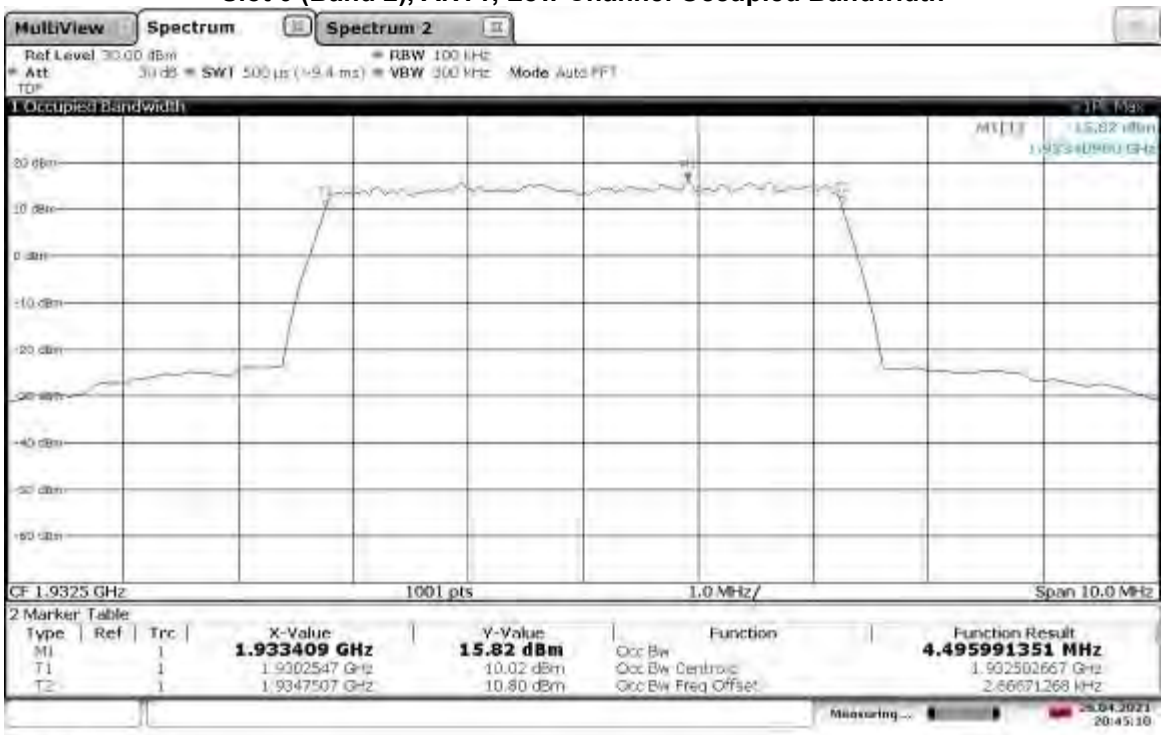
Confidential

7.5 Plots/Data:

TM1.1-QPSK_5 MHz Bandwidth
Slot 0 (Band 2), ANT0, Low Channel Occupied Bandwidth

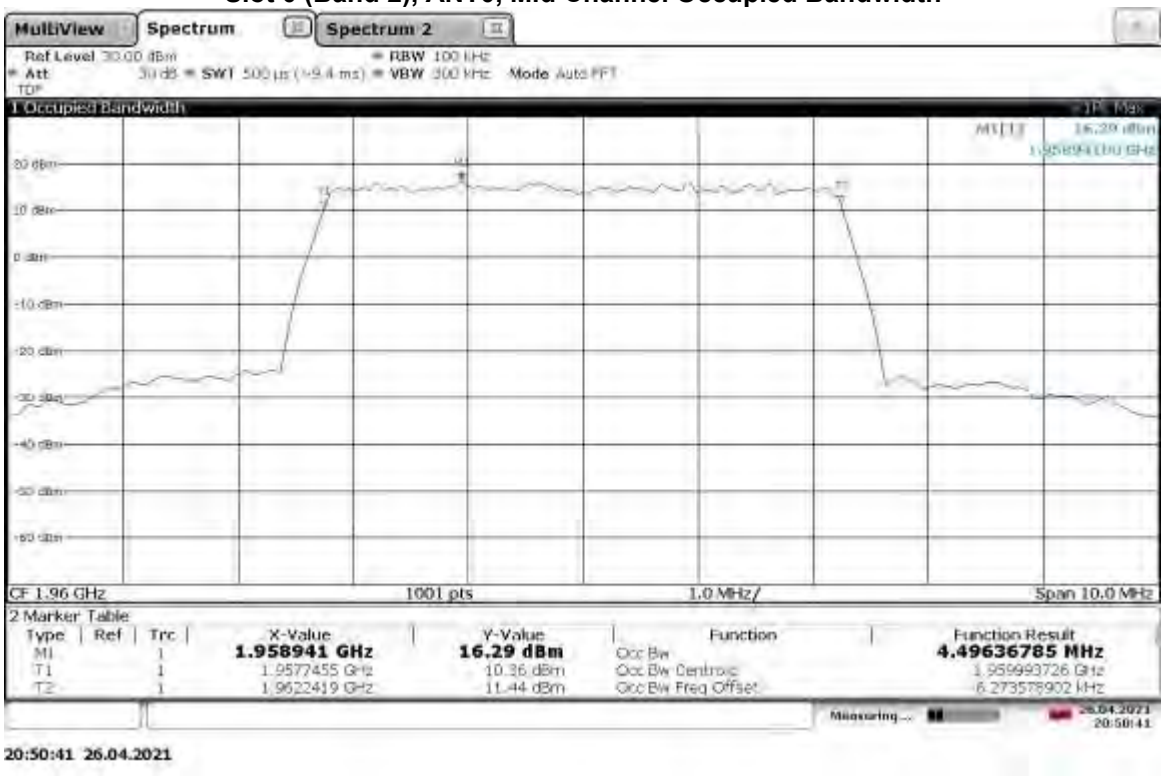


TM1.1-QPSK_5 MHz Bandwidth
Slot 0 (Band 2), ANT1, Low Channel Occupied Bandwidth



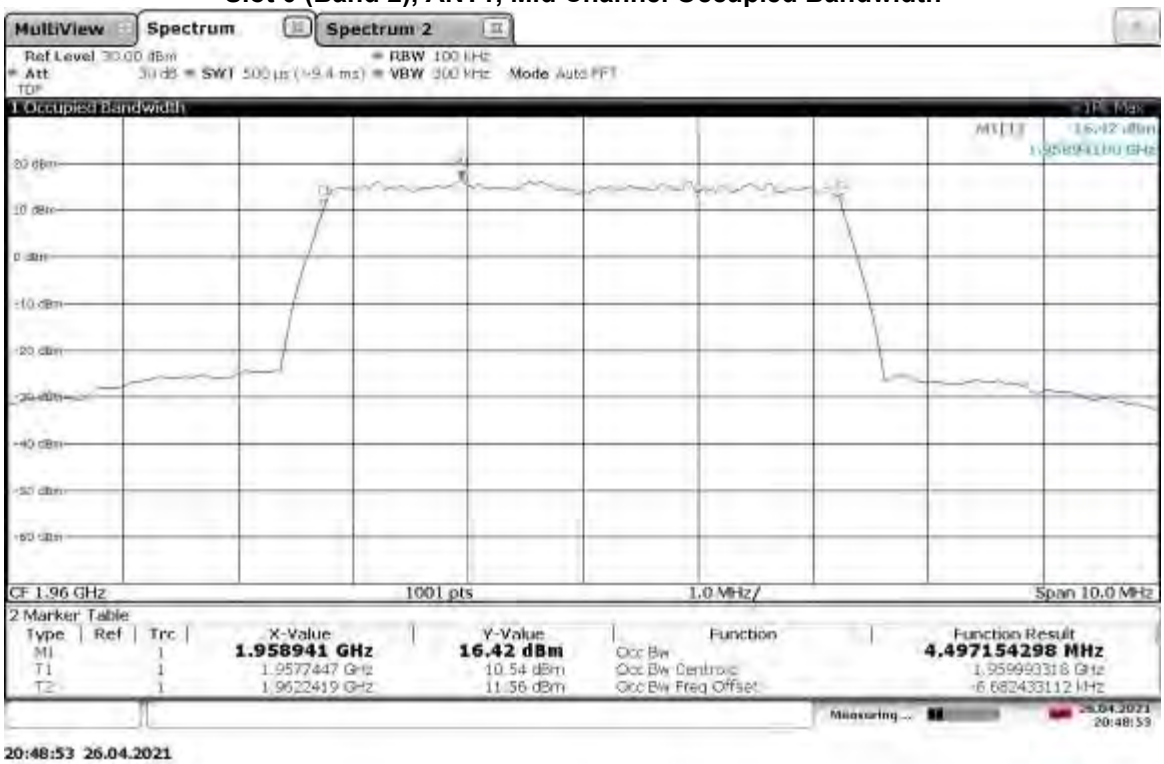
TM1.1-QPSK_5 MHz Bandwidth

Slot 0 (Band 2), ANT0, Mid Channel Occupied Bandwidth



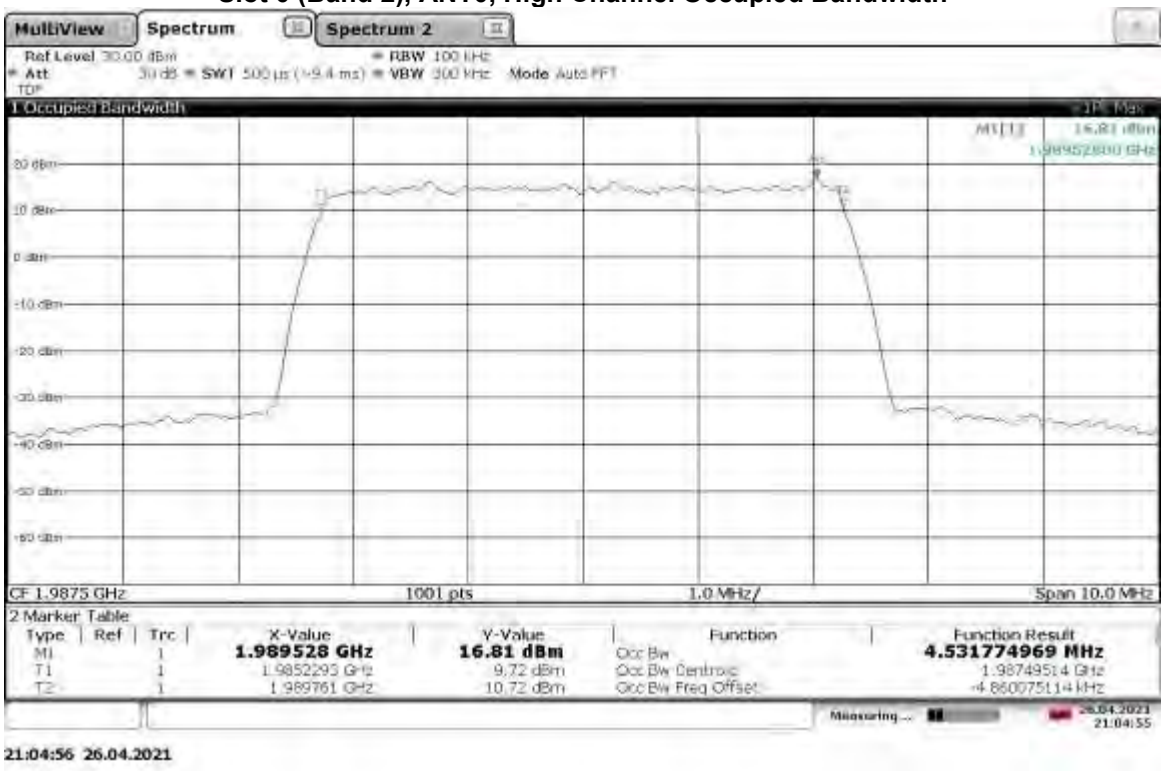
TM1.1-QPSK_5 MHz Bandwidth

Slot 0 (Band 2), ANT1, Mid Channel Occupied Bandwidth



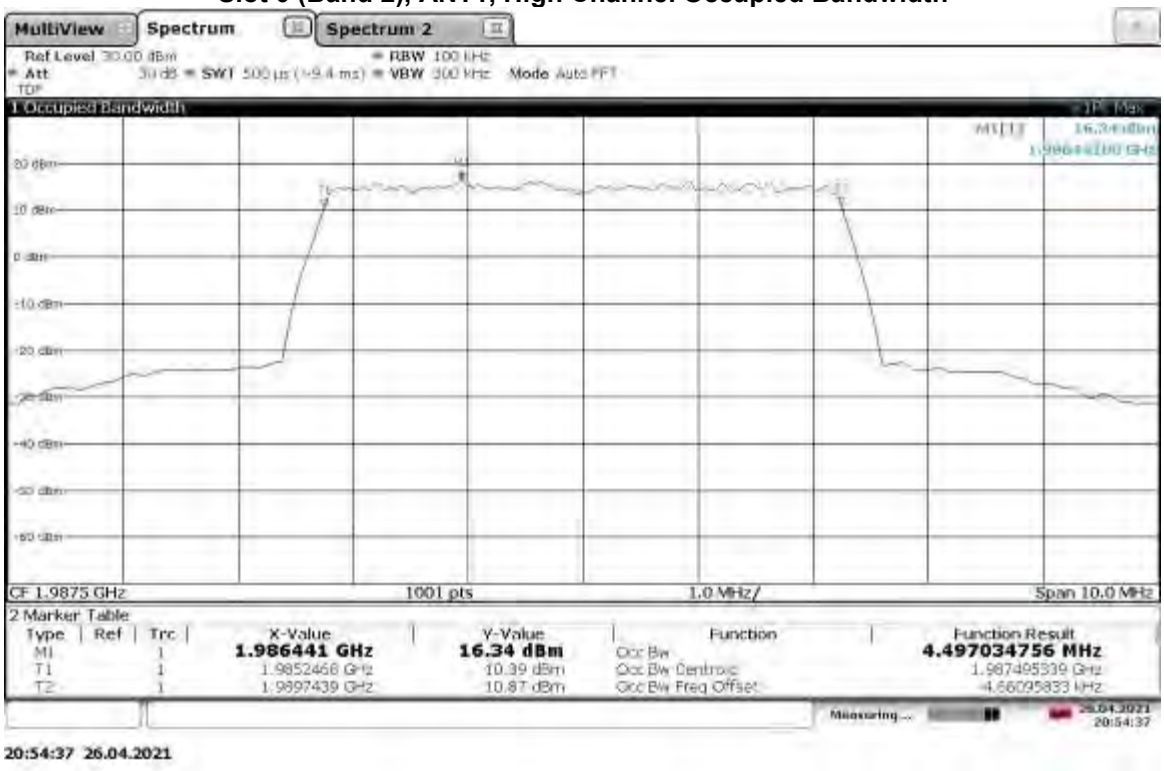
TM1.1-QPSK_5 MHz Bandwidth

Slot 0 (Band 2), ANT0, High Channel Occupied Bandwidth



TM1.1-QPSK_5 MHz Bandwidth

Slot 0 (Band 2), ANT1, High Channel Occupied Bandwidth



TM1.1-QPSK_10 MHz Bandwidth

Slot 0 (Band 2), ANT0, Low Channel Occupied Bandwidth

21:50:38 26.04.2021

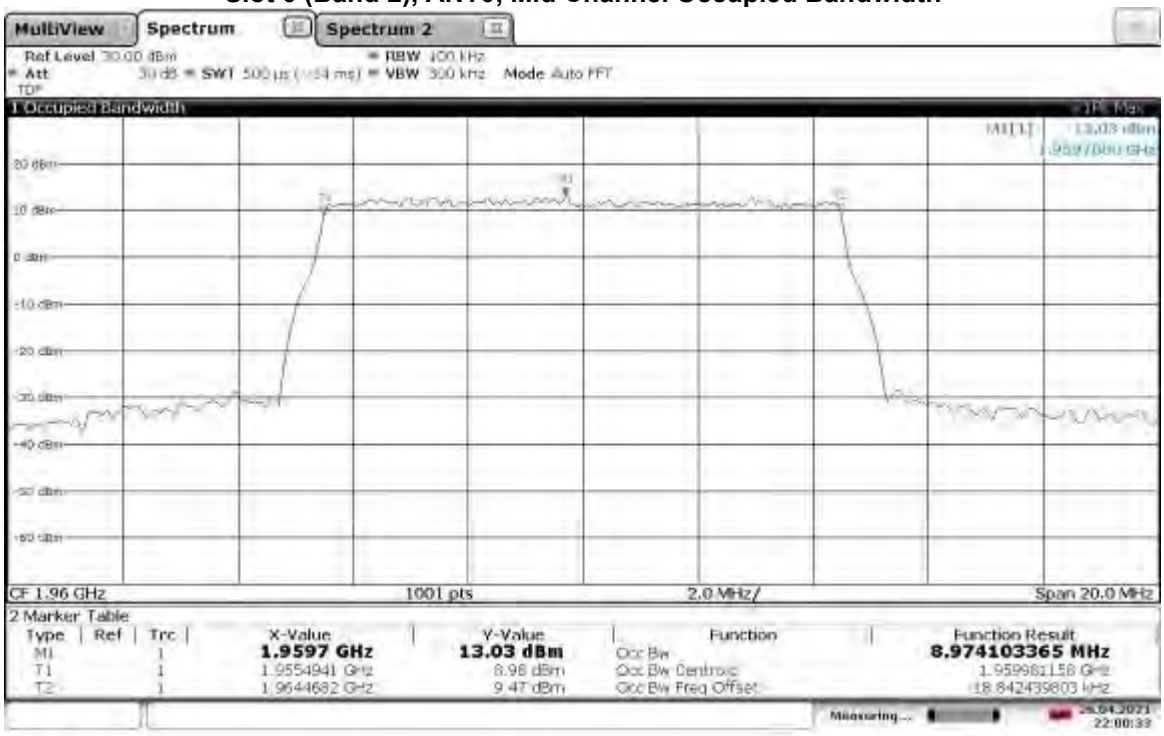
TM1.1-QPSK_10 MHz Bandwidth

Slot 0 (Band 2), ANT1, Low Channel Occupied Bandwidth

21:55:28 26.04.2021

TM1.1-QPSK_10 MHz Bandwidth

Slot 0 (Band 2), ANT0, Mid Channel Occupied Bandwidth



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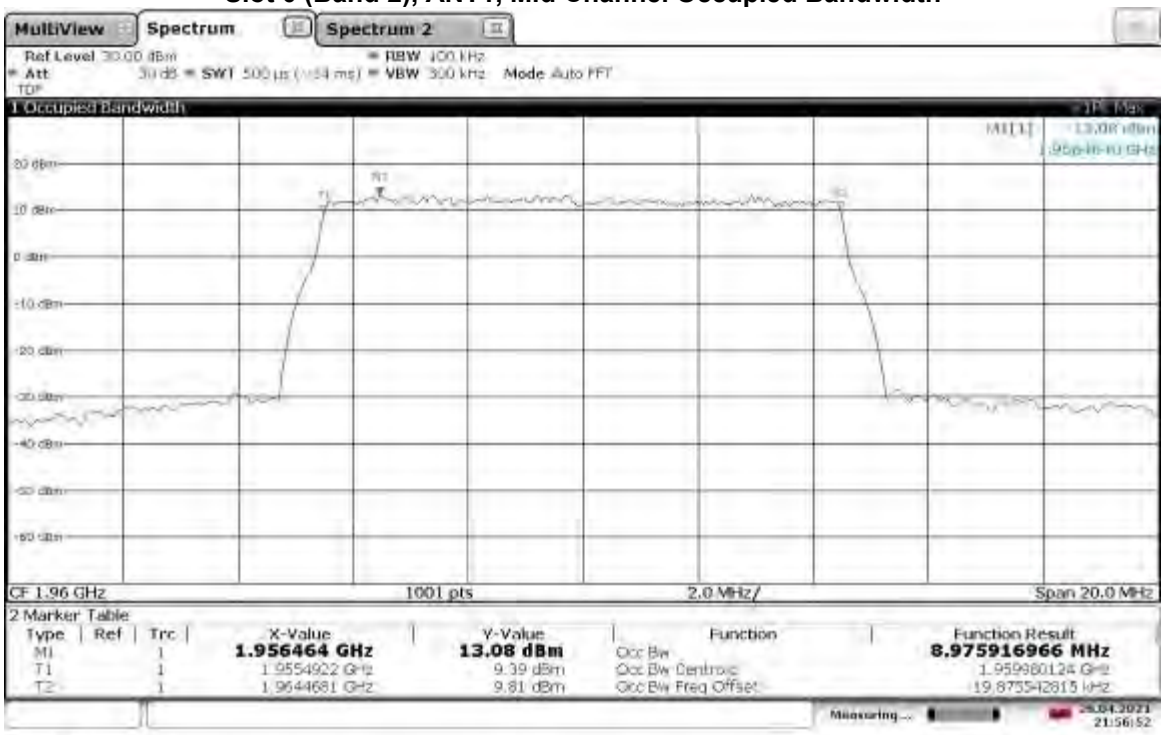
TM1.1-QPSK_10 MHz Bandwidth

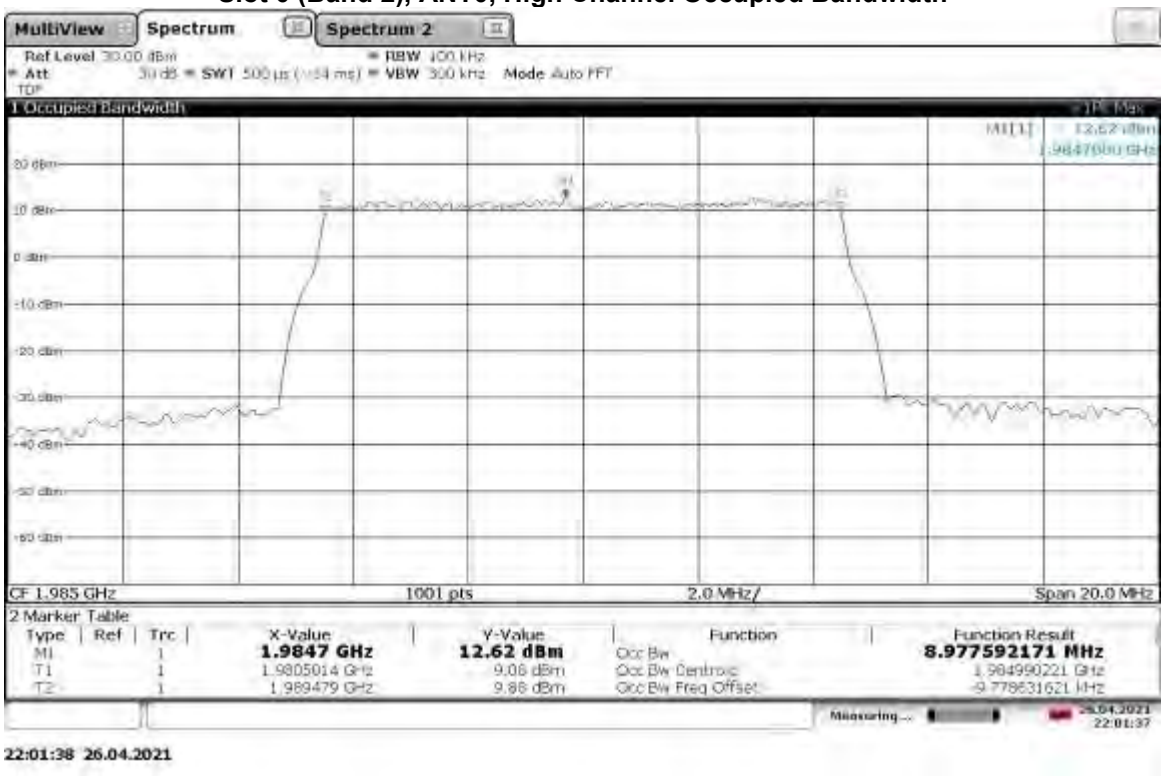
Slot 0 (Band 2), ANT1, Mid Channel Occupied Bandwidth



21:56:52 26.04.2021

TM1.1-QPSK_10 MHz Bandwidth

Slot 0 (Band 2), ANT0, High Channel Occupied Bandwidth

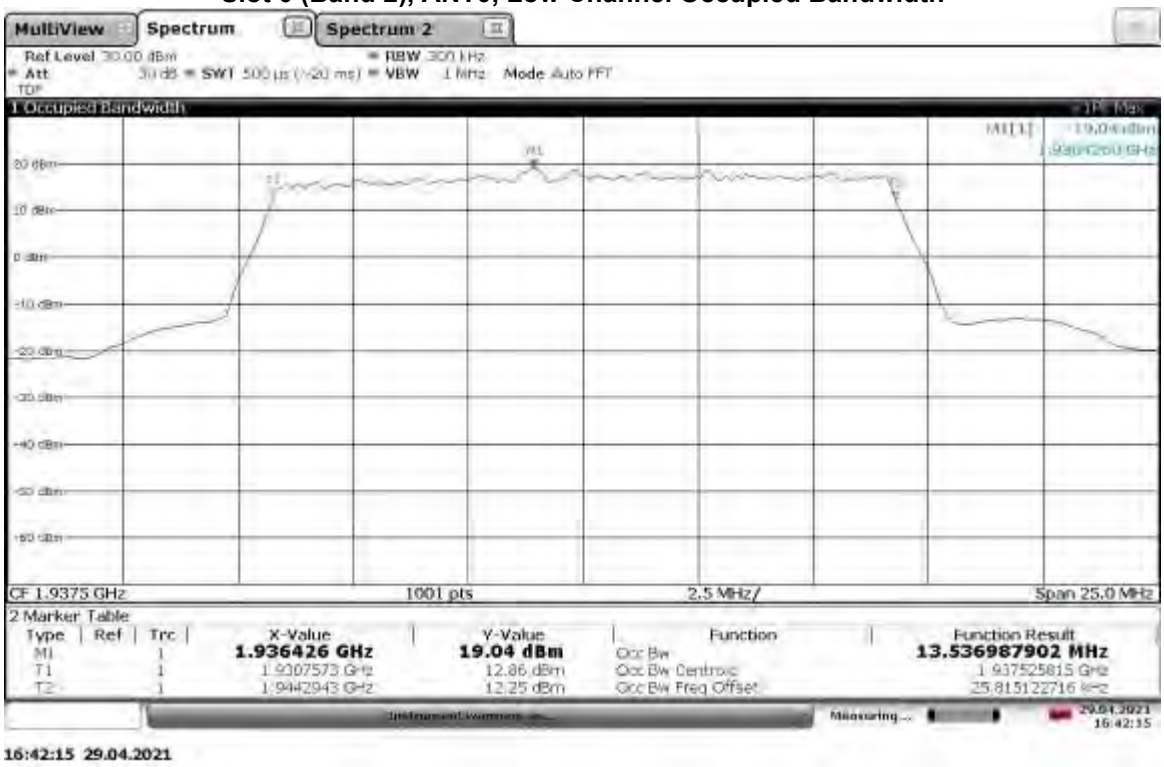


TM1.1-QPSK_10 MHz Bandwidth

Slot 0 (Band 2), ANT1, High Channel Occupied Bandwidth

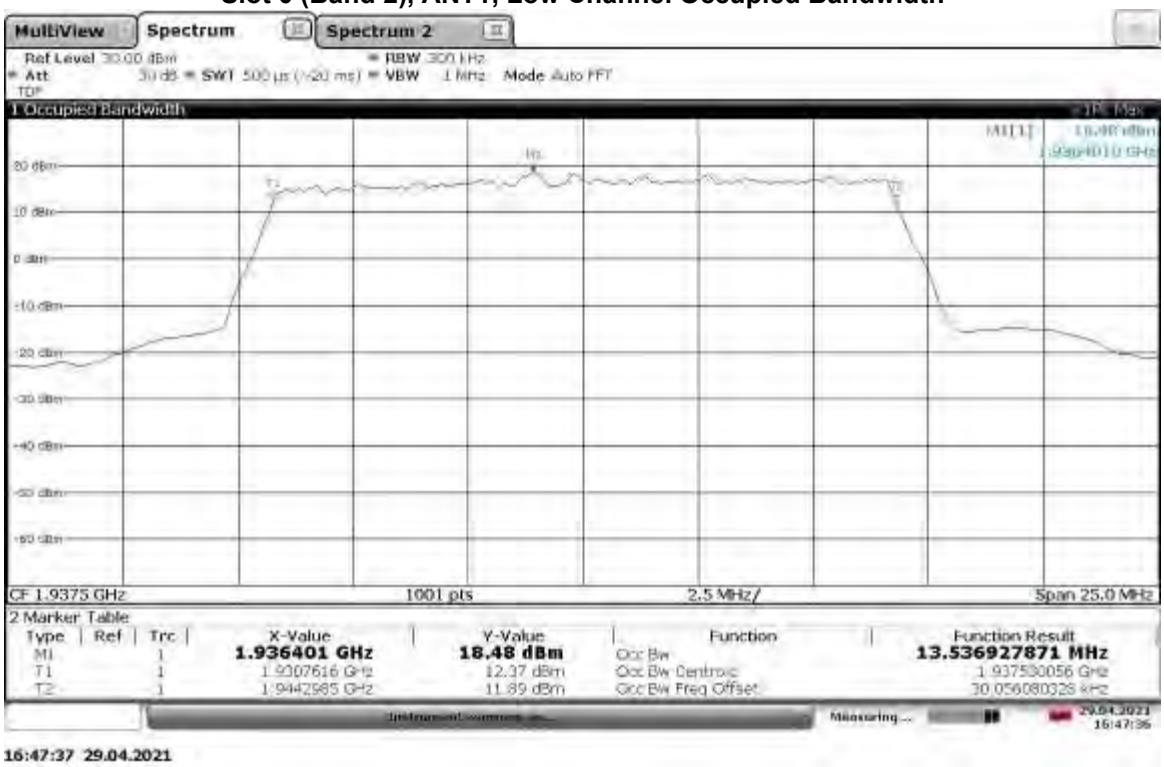
TM1.1-QPSK_15 MHz Bandwidth

Slot 0 (Band 2), ANT0, Low Channel Occupied Bandwidth



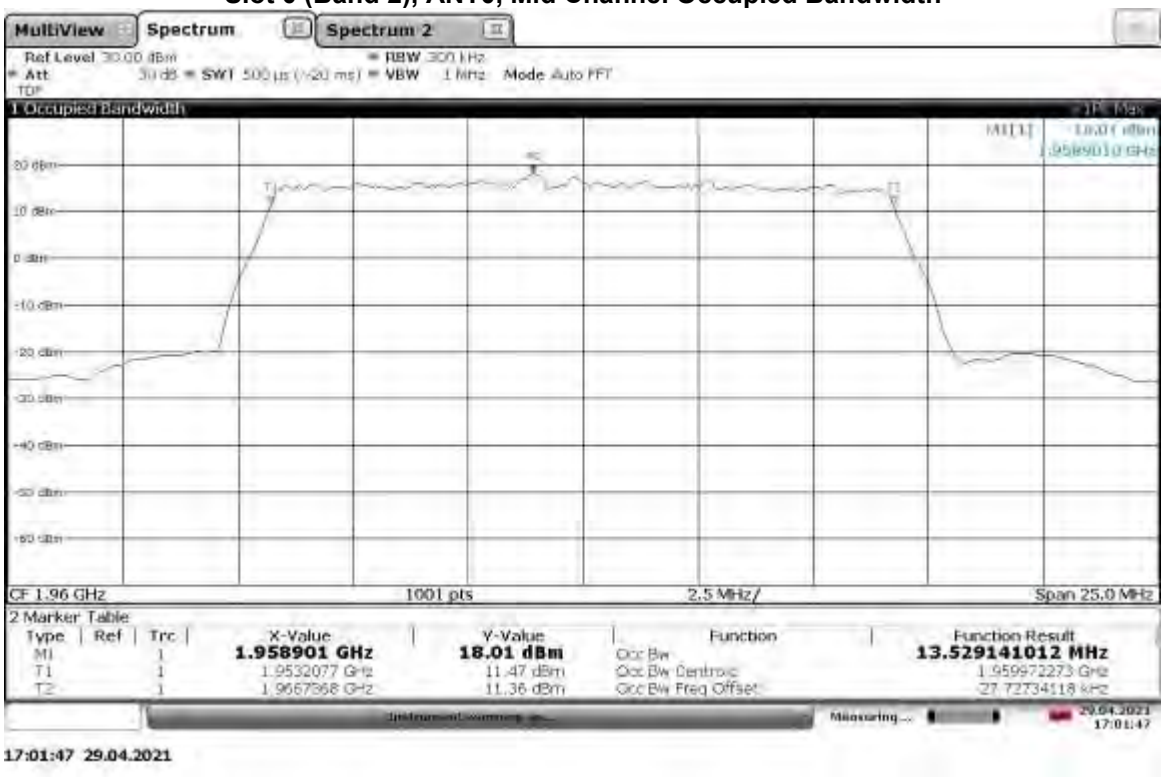
TM1.1-QPSK_15 MHz Bandwidth

Slot 0 (Band 2), ANT1, Low Channel Occupied Bandwidth



TM1.1-QPSK_15 MHz Bandwidth

Slot 0 (Band 2), ANT0, Mid Channel Occupied Bandwidth



17:01:47 29.04.2021

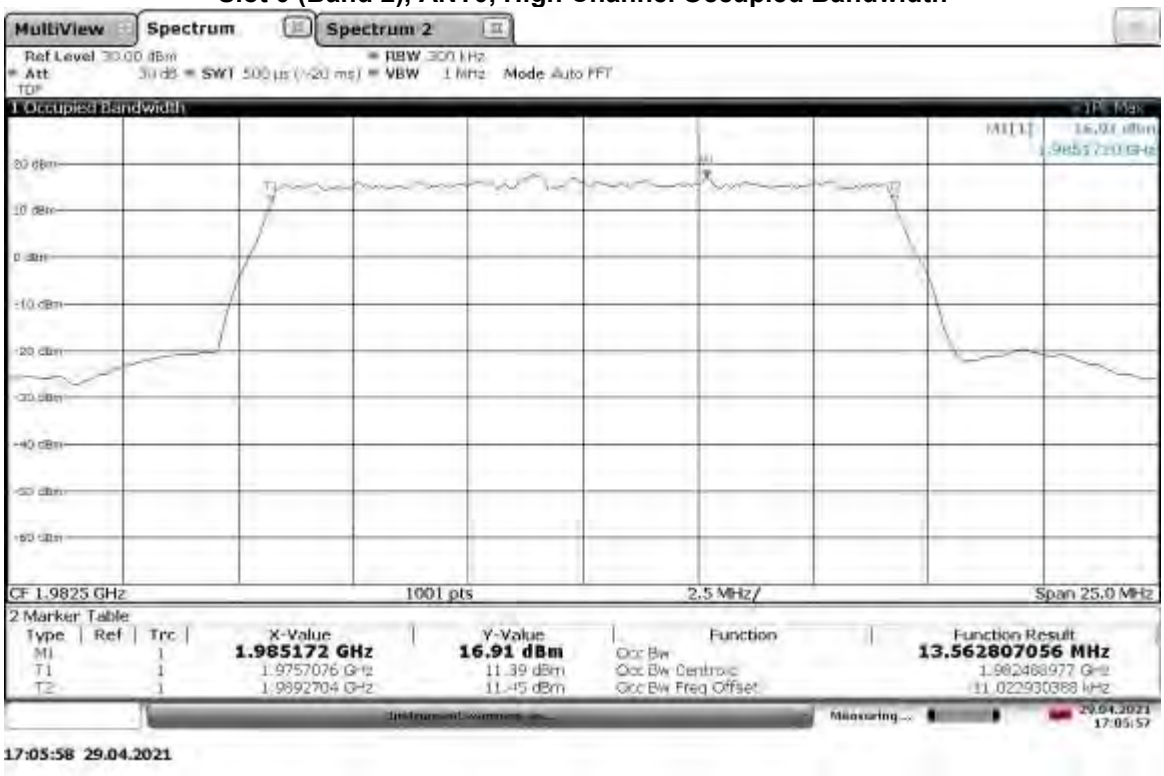
TM1.1-QPSK_15 MHz Bandwidth

Slot 0 (Band 2), ANT1, Mid Channel Occupied Bandwidth

16:49:06 29.04.2021

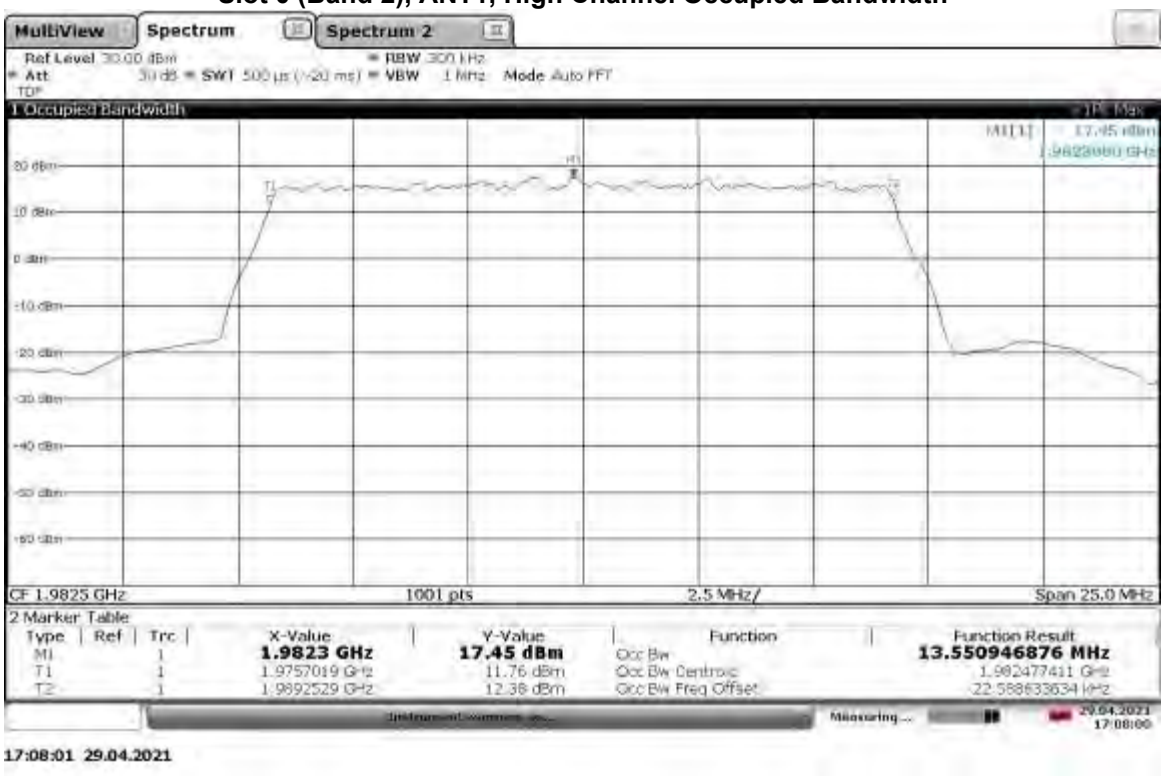
TM1.1-QPSK_15 MHz Bandwidth

Slot 0 (Band 2), ANT0, High Channel Occupied Bandwidth



TM1.1-QPSK_15 MHz Bandwidth

Slot 0 (Band 2), ANT1, High Channel Occupied Bandwidth



TM1.1-QPSK_20 MHz Bandwidth

Slot 0 (Band 2), ANT0, Low Channel Occupied Bandwidth

18:00:23 29.04.2021

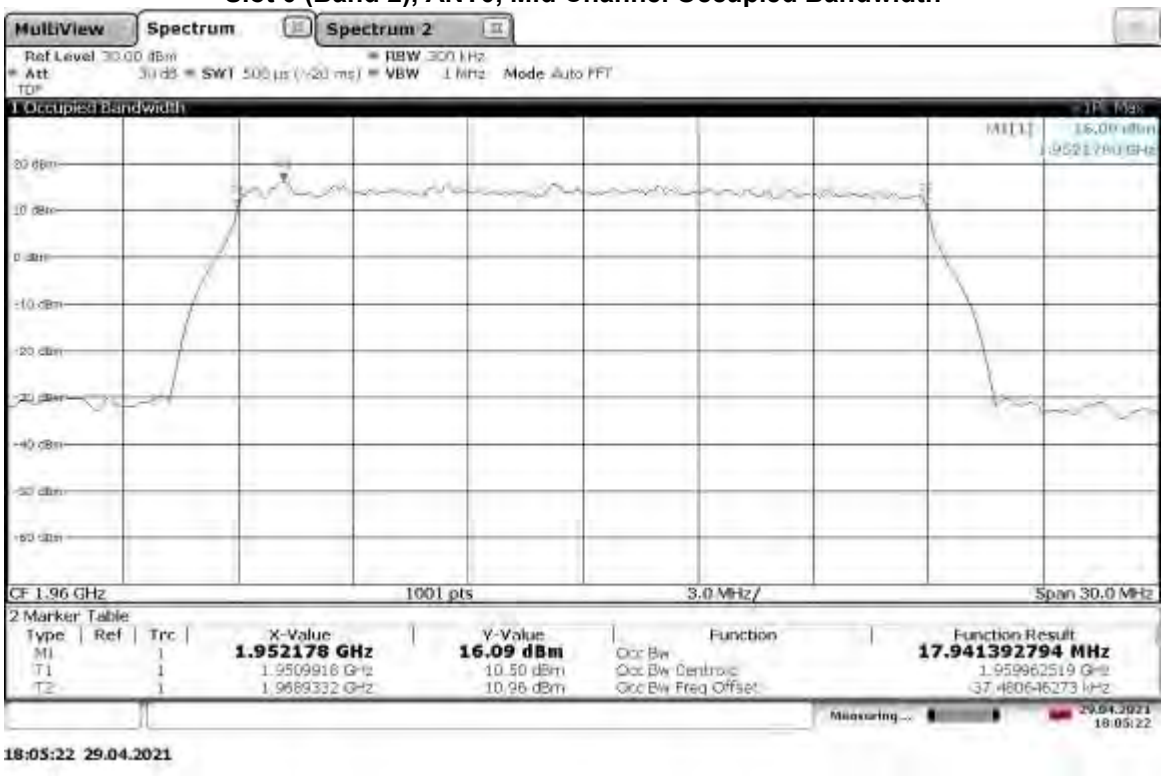
TM1.1-QPSK_20 MHz Bandwidth

Slot 0 (Band 2), ANT1, Low Channel Occupied Bandwidth

18:02:45 29.04.2021

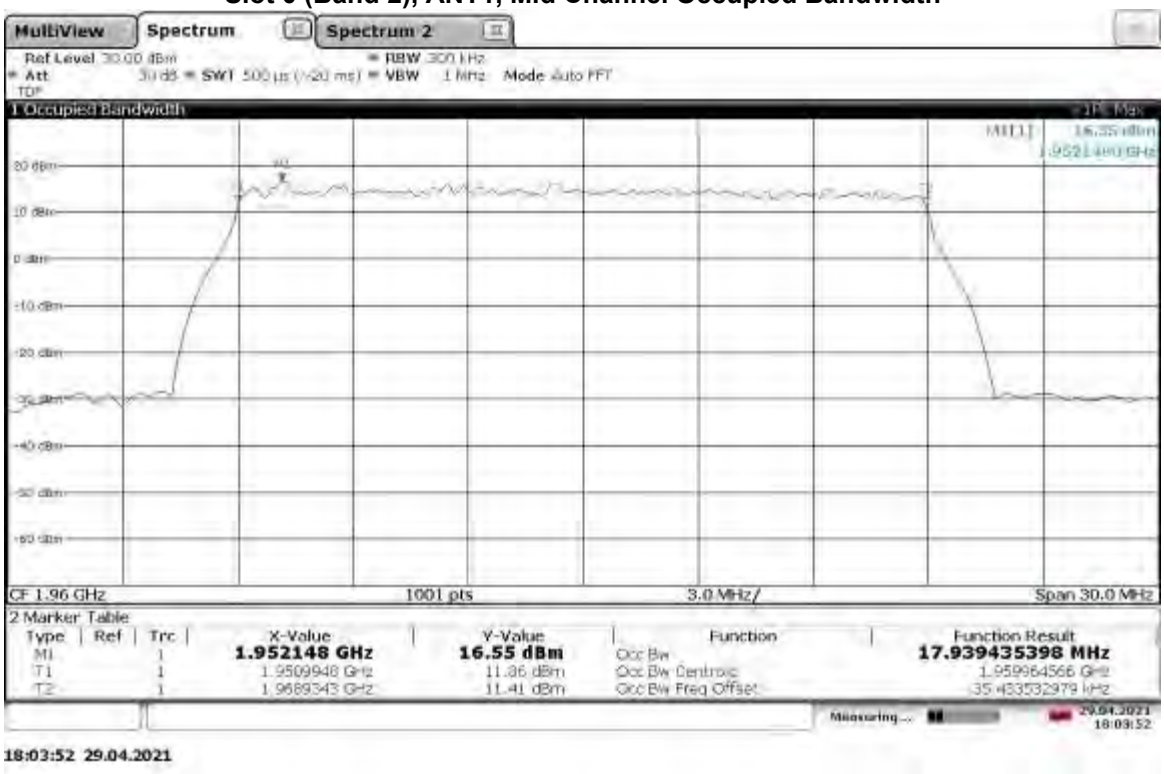
TM1.1-QPSK_20 MHz Bandwidth

Slot 0 (Band 2), ANT0, Mid Channel Occupied Bandwidth



TM1.1-QPSK_20 MHz Bandwidth

Slot 0 (Band 2), ANT1, Mid Channel Occupied Bandwidth



TM1.1-QPSK_20 MHz Bandwidth

Slot 0 (Band 2), ANT0, High Channel Occupied Bandwidth

18:06:31 29.04.2021

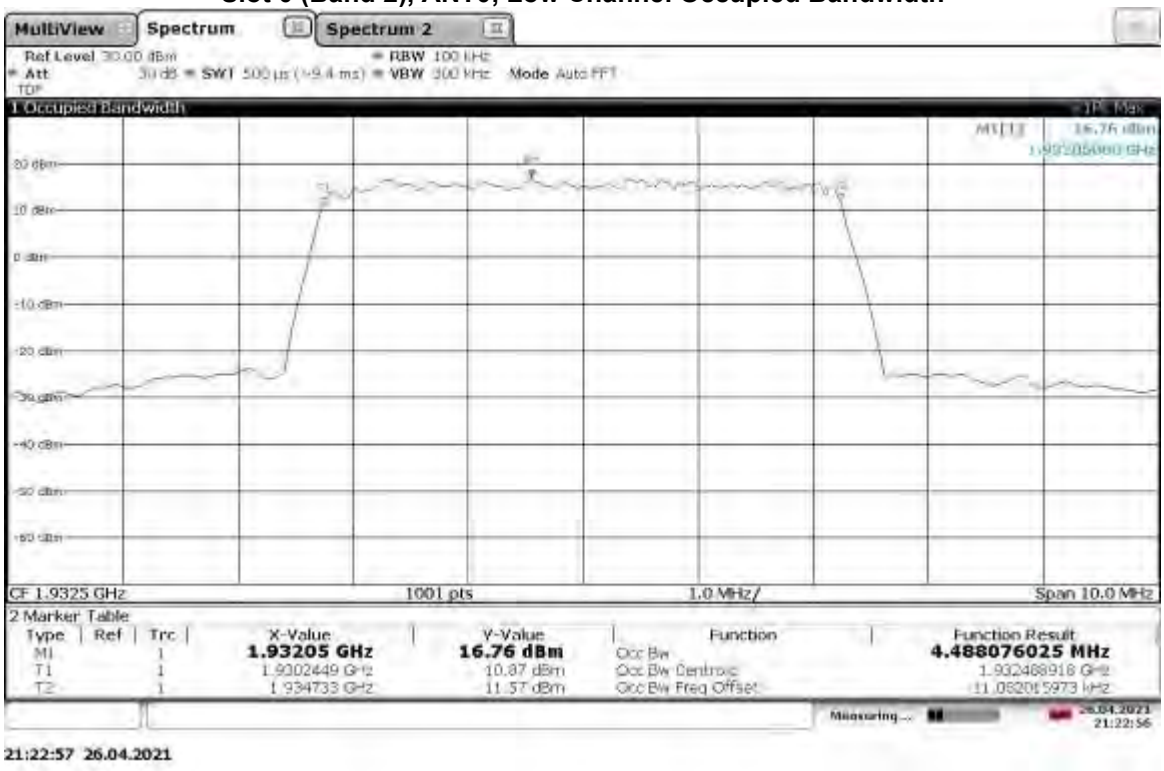
TM1.1-QPSK_20 MHz Bandwidth

Slot 0 (Band 2), ANT1, High Channel Occupied Bandwidth

18:08:12 29.04.2021

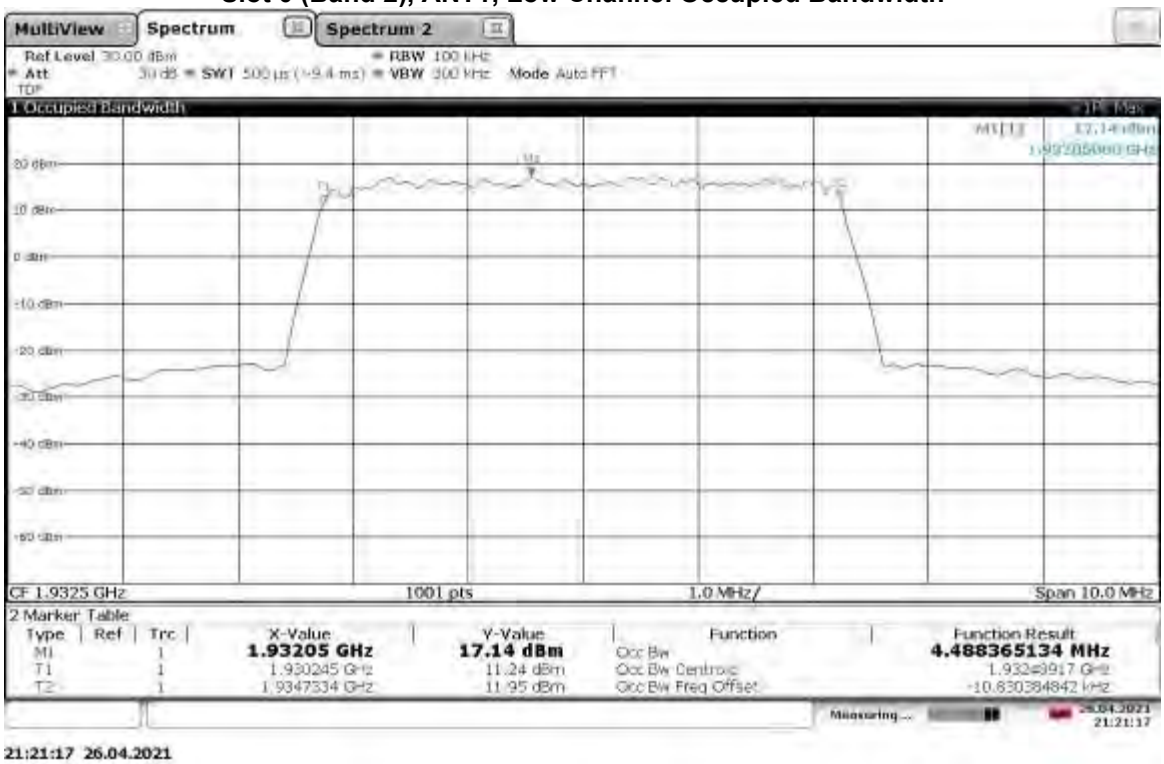
TM3.2-16QAM_5 MHz Bandwidth

Slot 0 (Band 2), ANT0, Low Channel Occupied Bandwidth



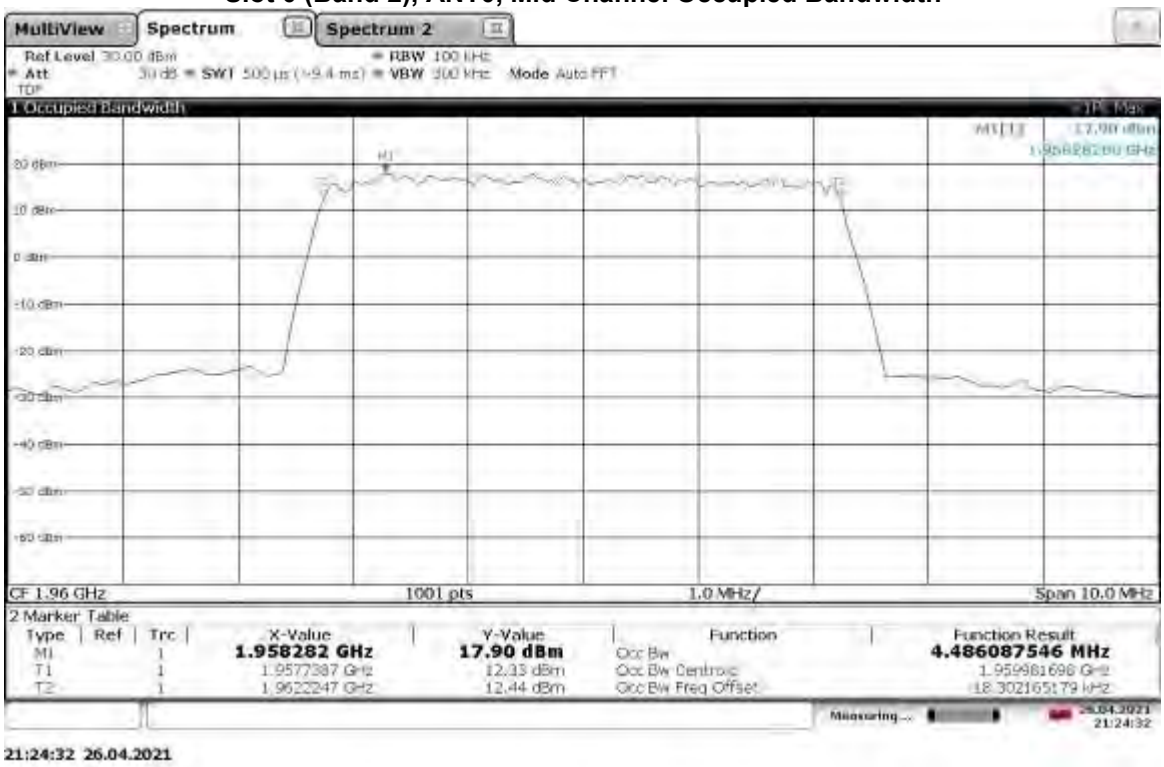
TM3.2-16QAM_5 MHz Bandwidth

Slot 0 (Band 2), ANT1, Low Channel Occupied Bandwidth



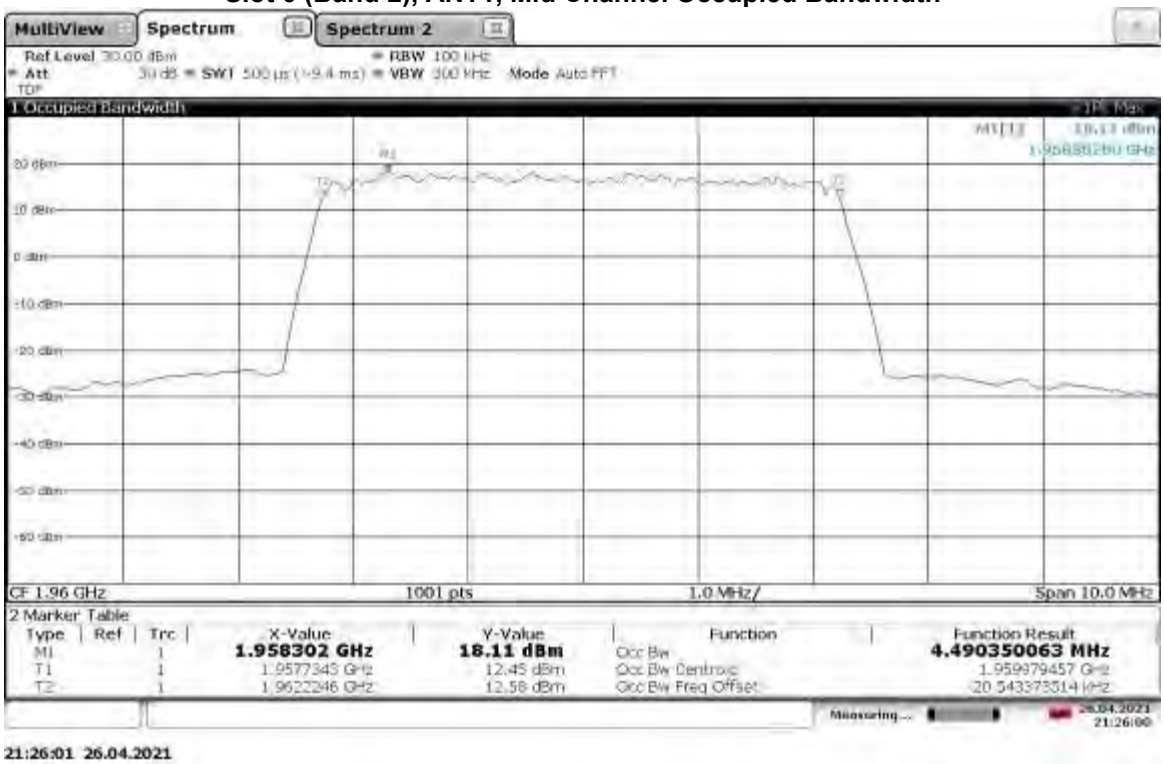
TM3.2-16QAM_5 MHz Bandwidth

Slot 0 (Band 2), ANT0, Mid Channel Occupied Bandwidth



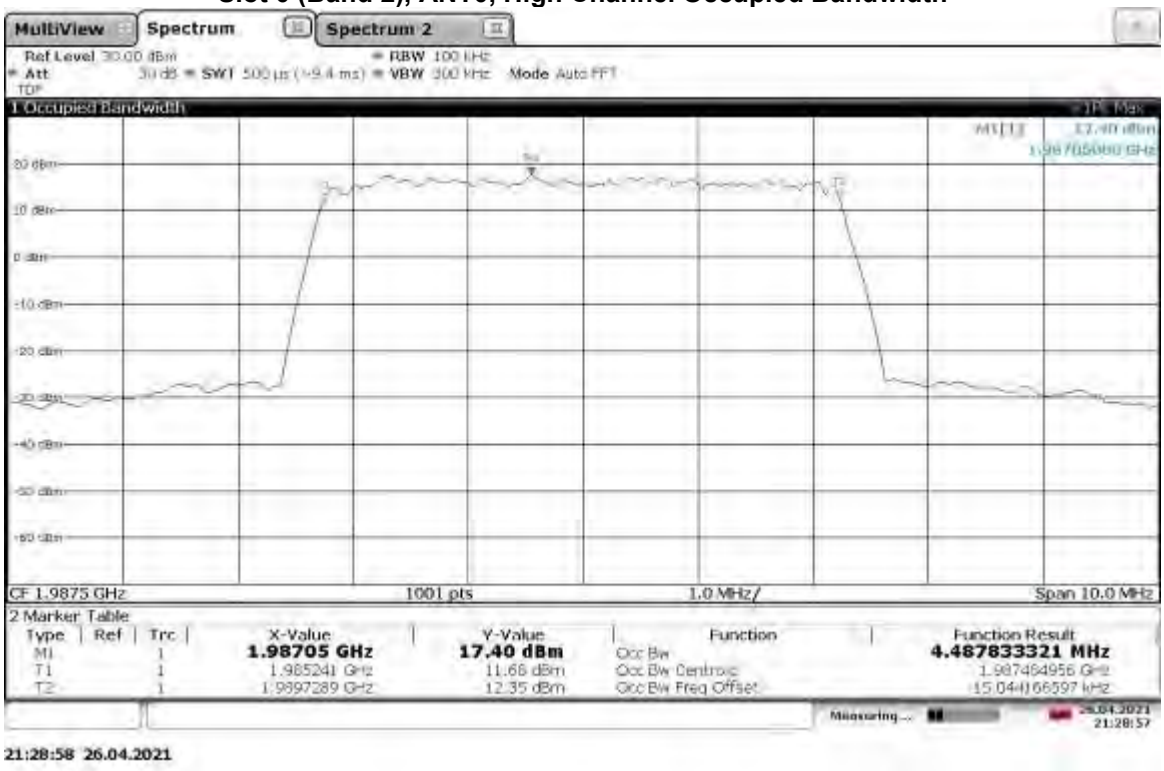
TM3.2-16QAM_5 MHz Bandwidth

Slot 0 (Band 2), ANT1, Mid Channel Occupied Bandwidth



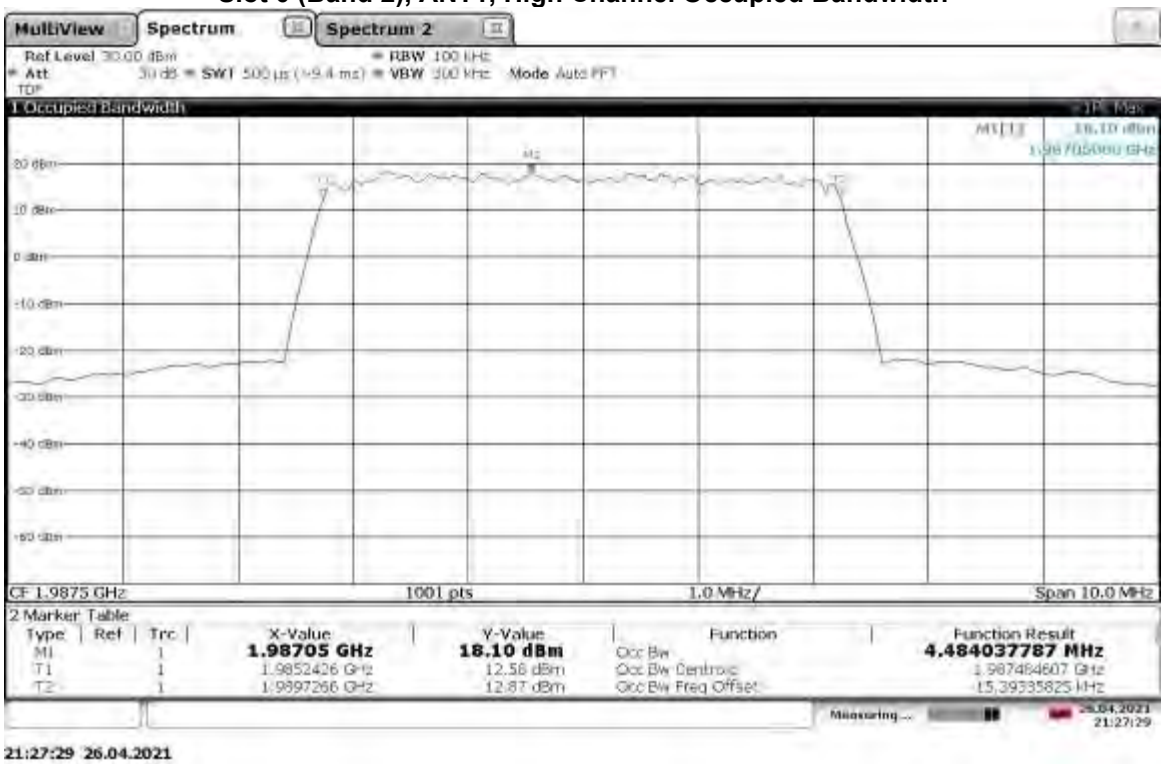
TM3.2-16QAM_5 MHz Bandwidth

Slot 0 (Band 2), ANT0, High Channel Occupied Bandwidth



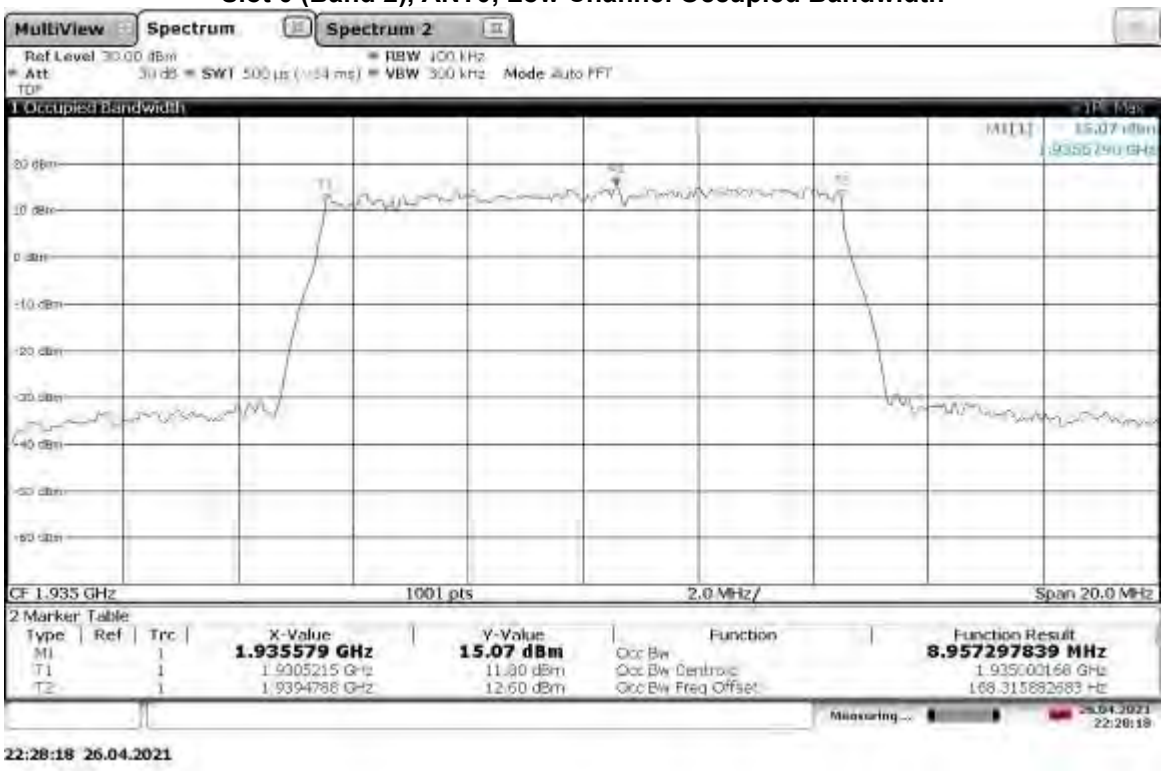
TM3.2-16QAM_5 MHz Bandwidth

Slot 0 (Band 2), ANT1, High Channel Occupied Bandwidth



TM3.2-16QAM_10 MHz Bandwidth

Slot 0 (Band 2), ANT0, Low Channel Occupied Bandwidth



22:28:18 26.04.2021

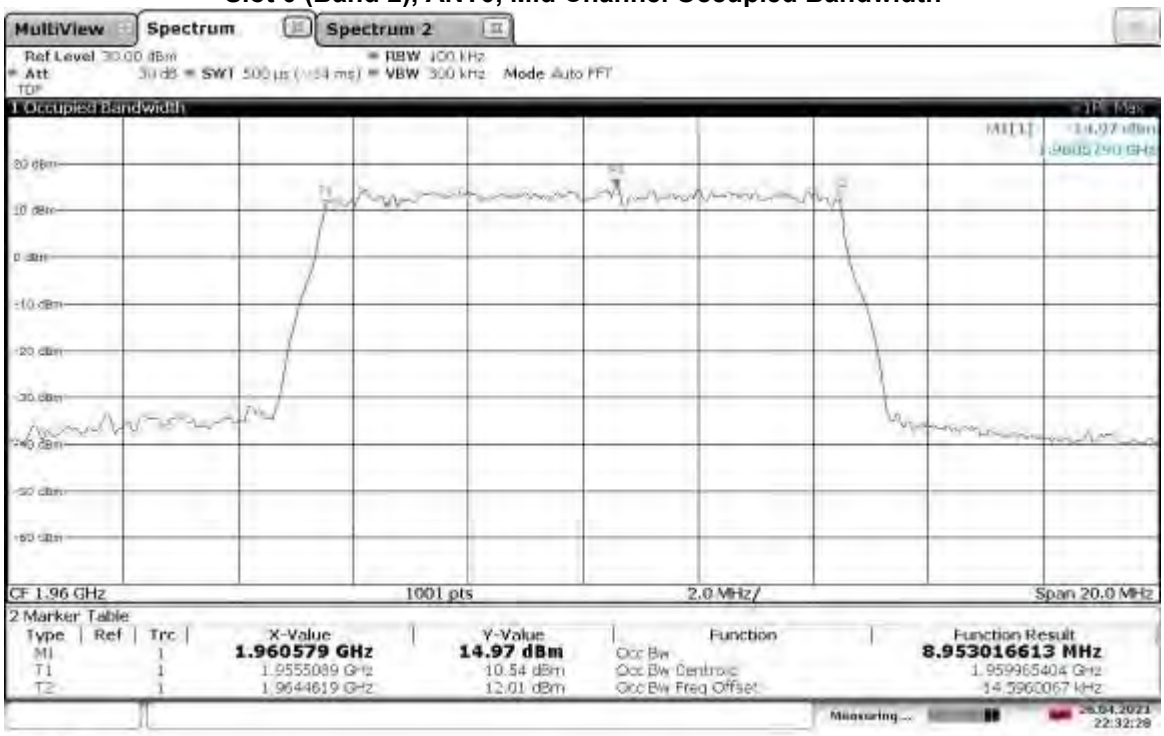
TM3.2-16QAM_10 MHz Bandwidth

Slot 0 (Band 2), ANT1, Low Channel Occupied Bandwidth

22:27:19 26.04.2021

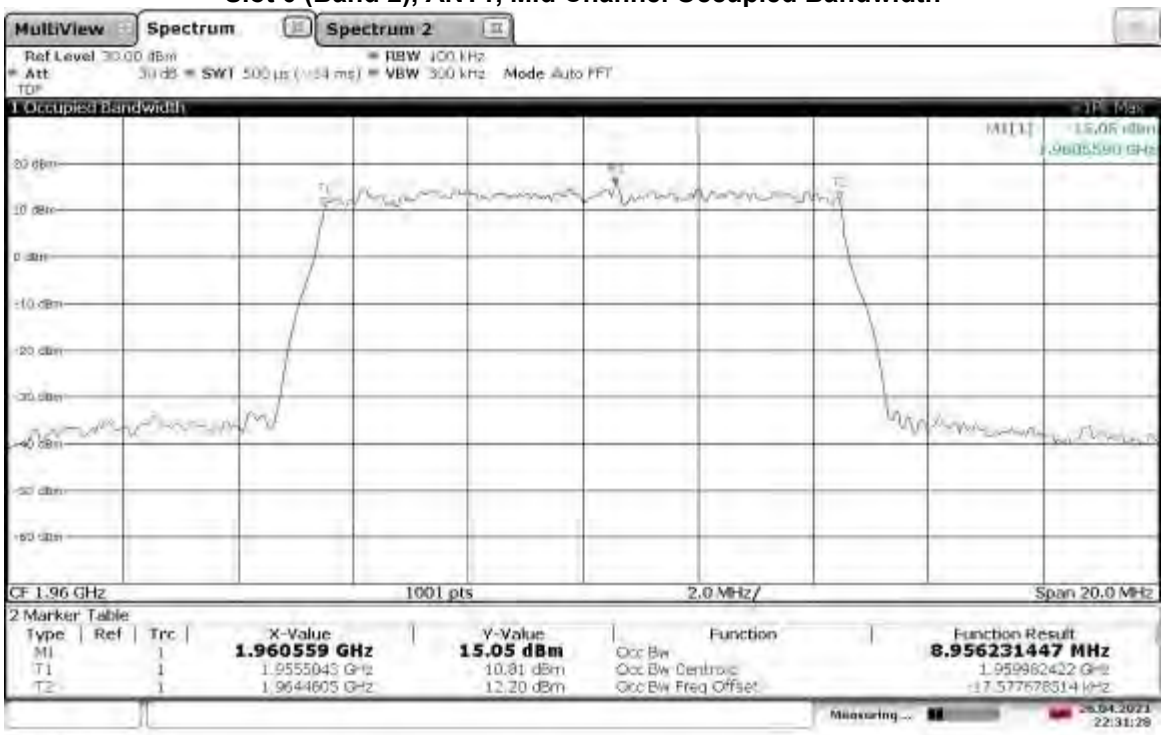
TM3.2-16QAM_10 MHz Bandwidth

Slot 0 (Band 2), ANT0, Mid Channel Occupied Bandwidth



TM3.2-16QAM_10 MHz Bandwidth

Slot 0 (Band 2), ANT1, Mid Channel Occupied Bandwidth



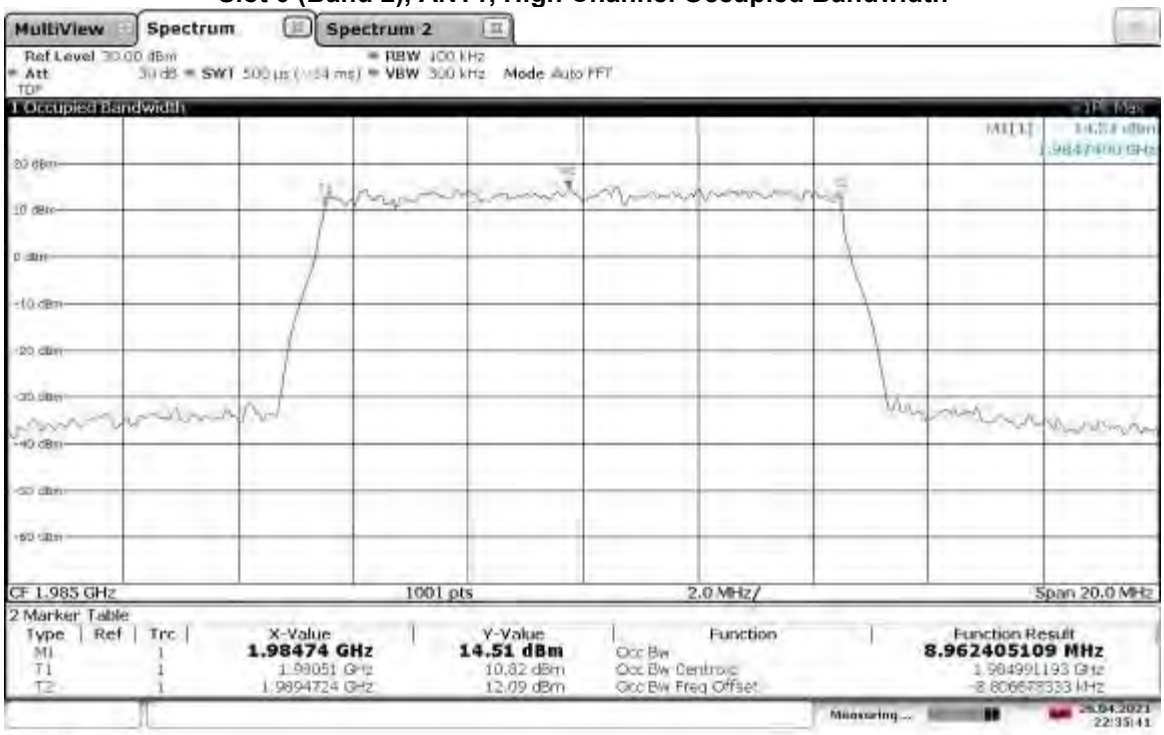
TM3.2-16QAM_10 MHz Bandwidth

Slot 0 (Band 2), ANT0, High Channel Occupied Bandwidth

22:35:05 26.04.2021

TM3.2-16QAM_10 MHz Bandwidth

Slot 0 (Band 2), ANT1, High Channel Occupied Bandwidth



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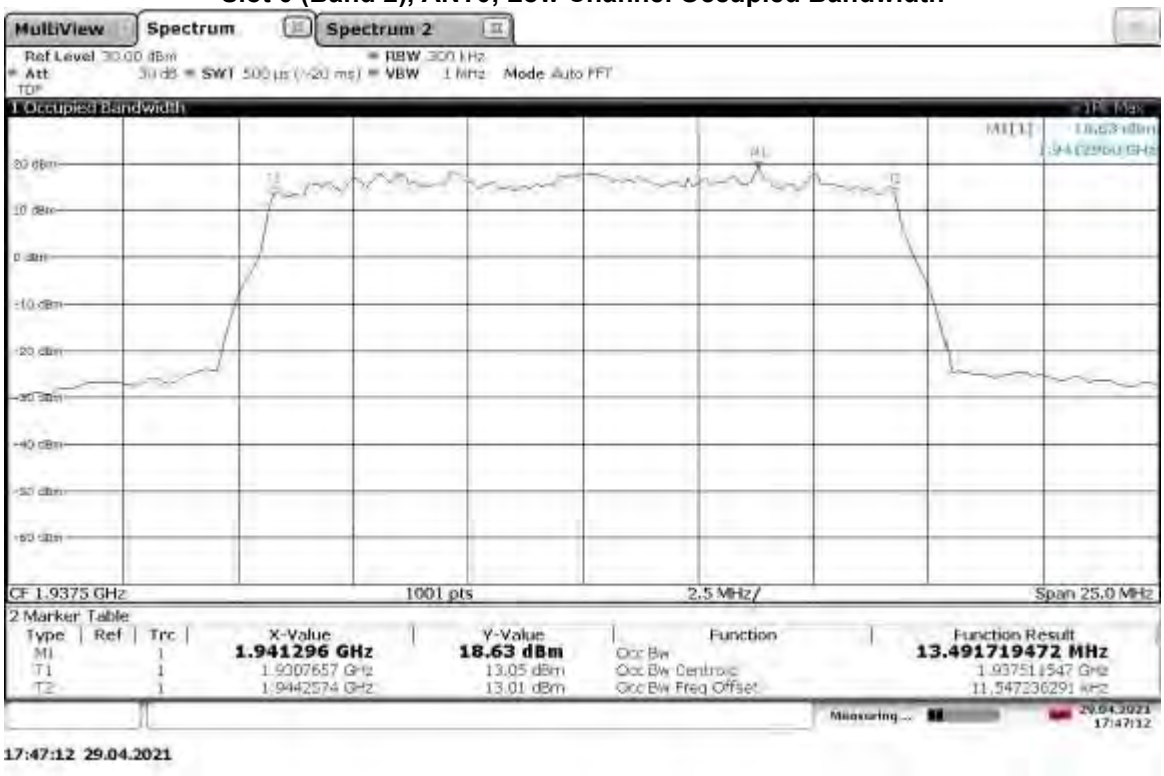
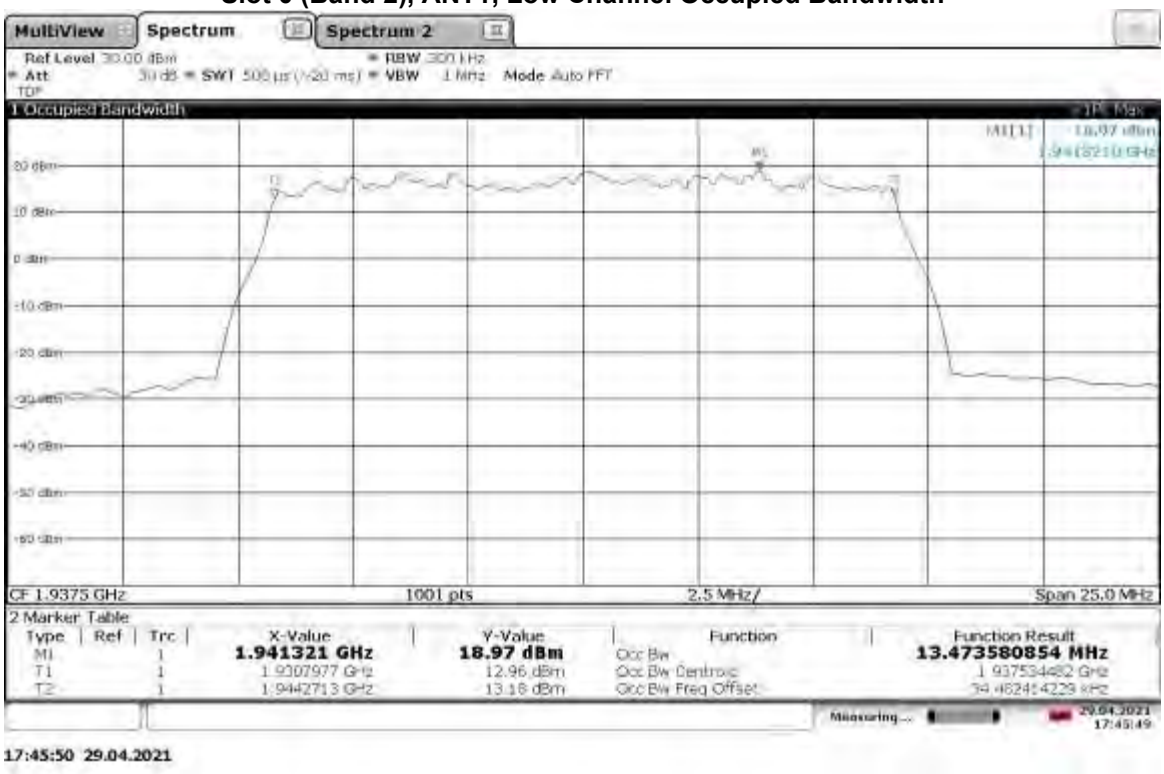
TM3.2-16QAM_15 MHz Bandwidth

Slot 0 (Band 2), ANT0, Low Channel Occupied Bandwidth



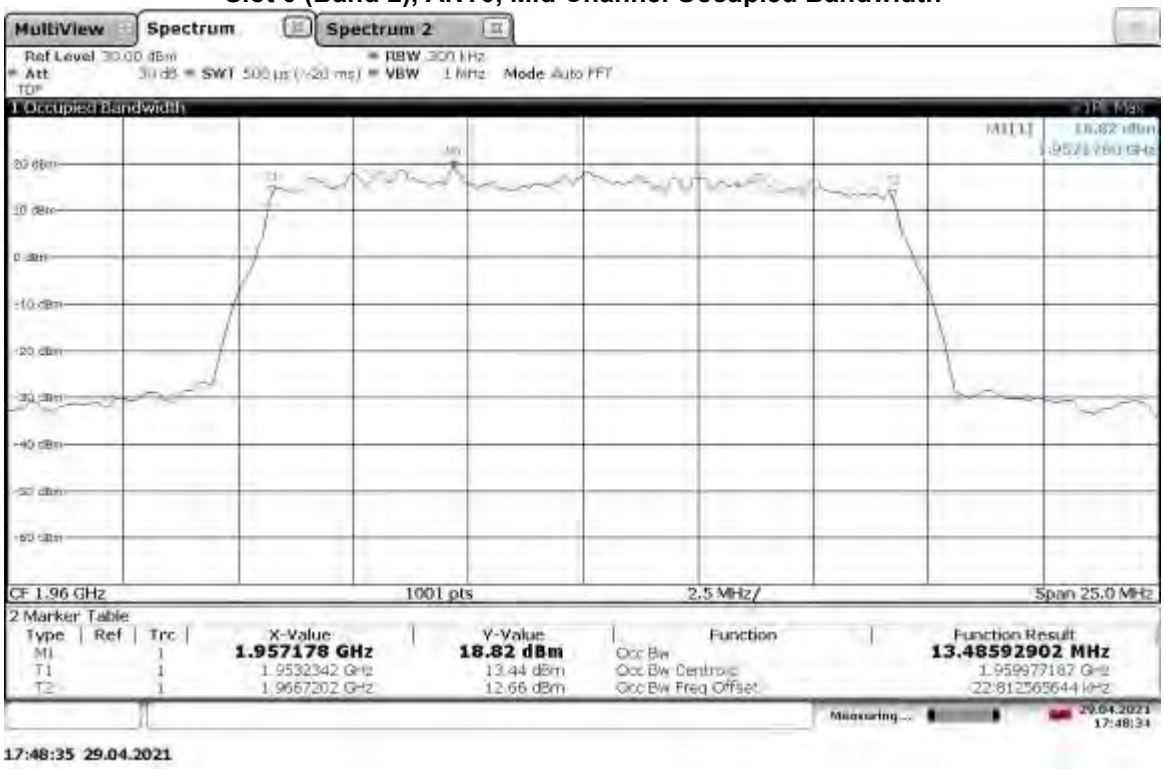
TM3.2-16QAM_15 MHz Bandwidth

Slot 0 (Band 2), ANT1, Low Channel Occupied Bandwidth



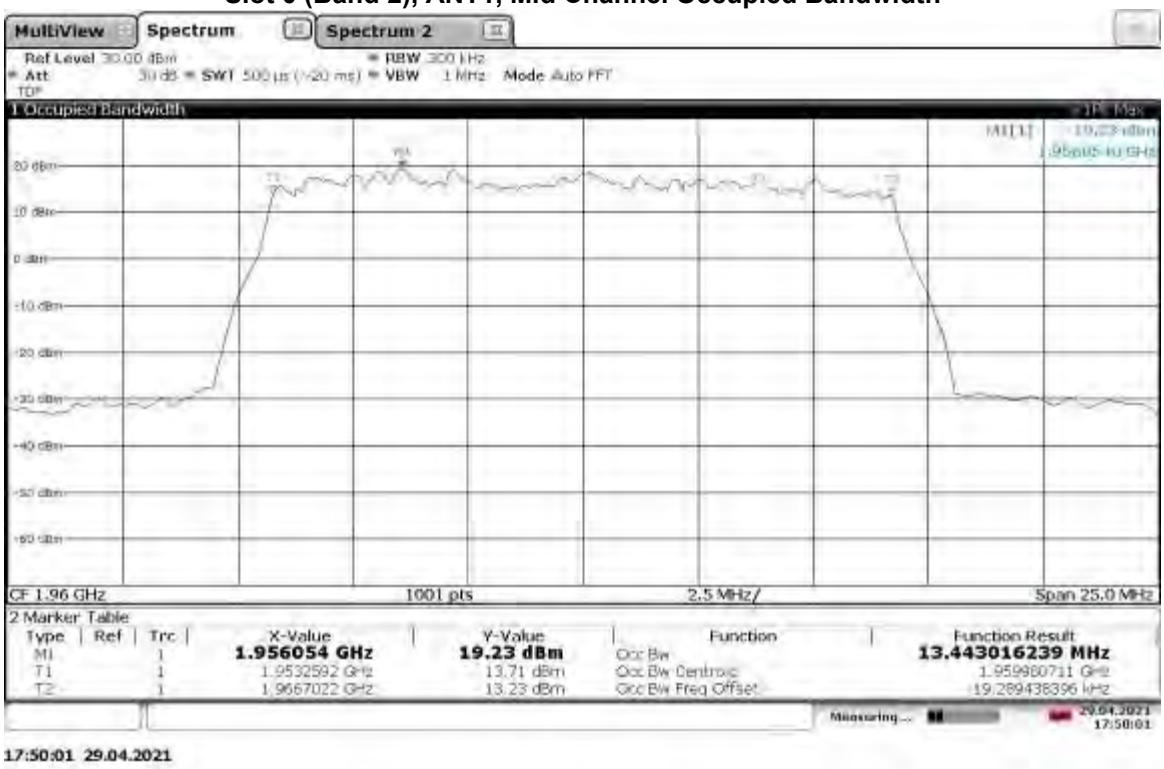
TM3.2-16QAM_15 MHz Bandwidth

Slot 0 (Band 2), ANT0, Mid Channel Occupied Bandwidth



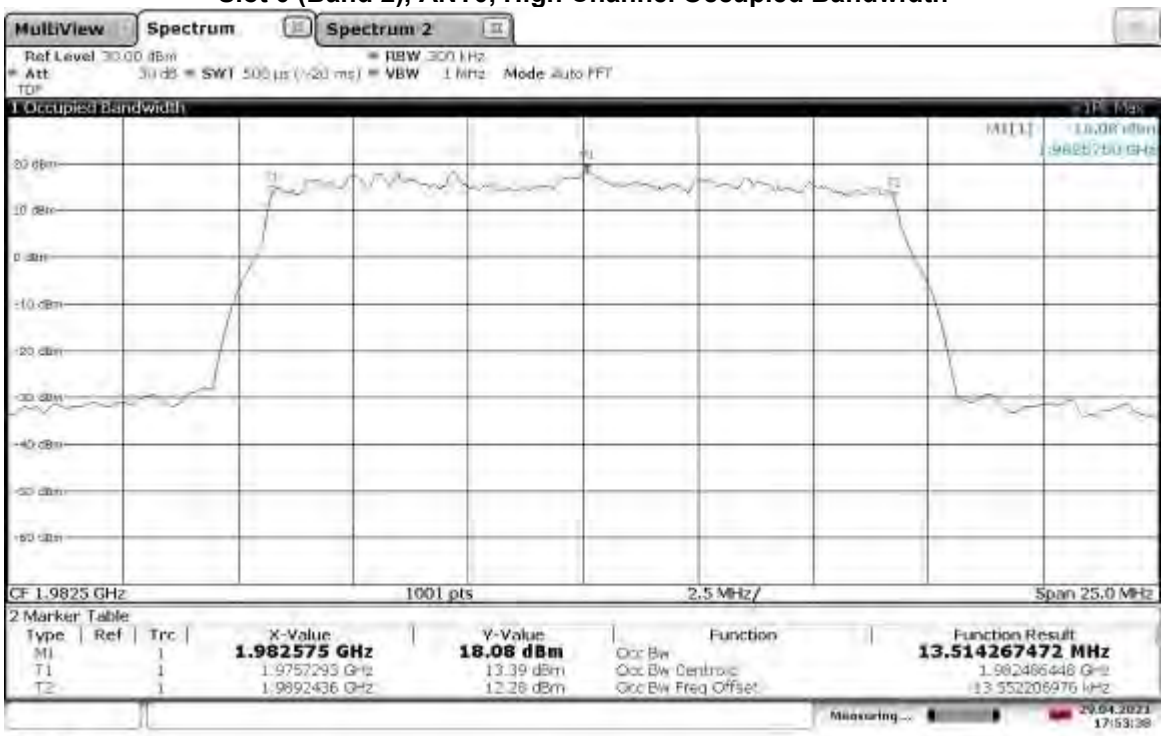
TM3.2-16QAM_15 MHz Bandwidth

Slot 0 (Band 2), ANT1, Mid Channel Occupied Bandwidth



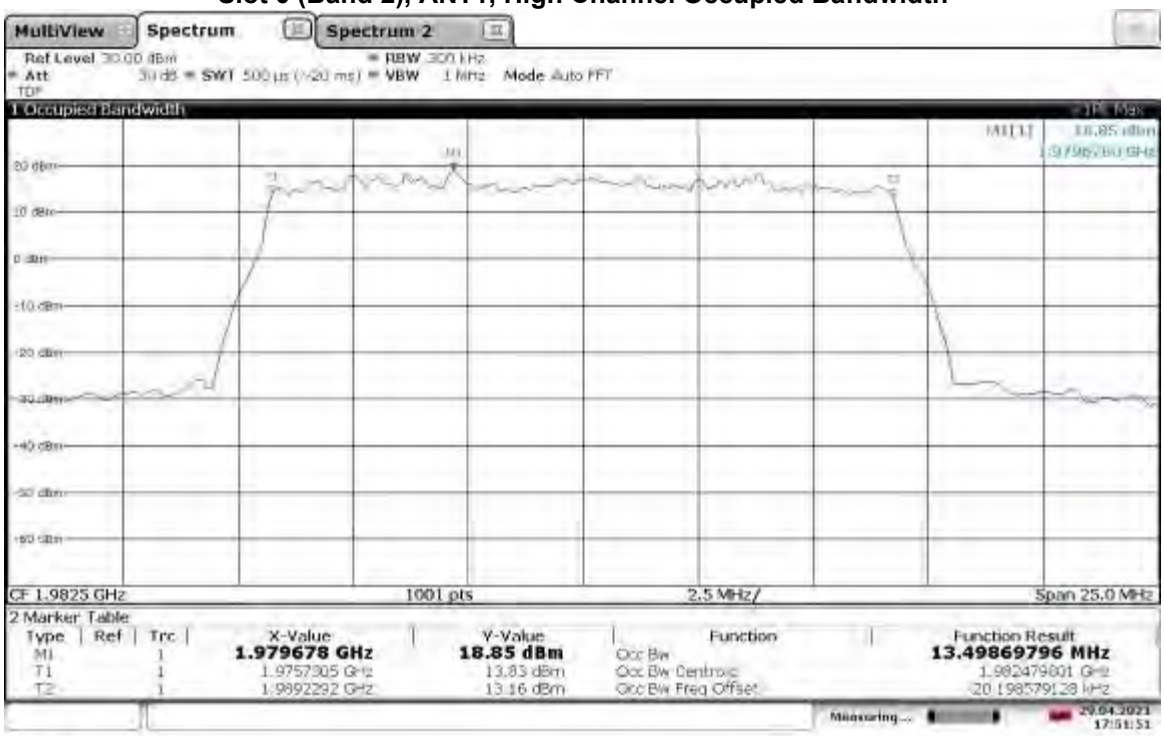
TM3.2-16QAM_15 MHz Bandwidth

Slot 0 (Band 2), ANT0, High Channel Occupied Bandwidth



TM3.2-16QAM_15 MHz Bandwidth

Slot 0 (Band 2), ANT1, High Channel Occupied Bandwidth



TM3.2-16QAM_20 MHz Bandwidth

Slot 0 (Band 2), ANT0, Low Channel Occupied Bandwidth

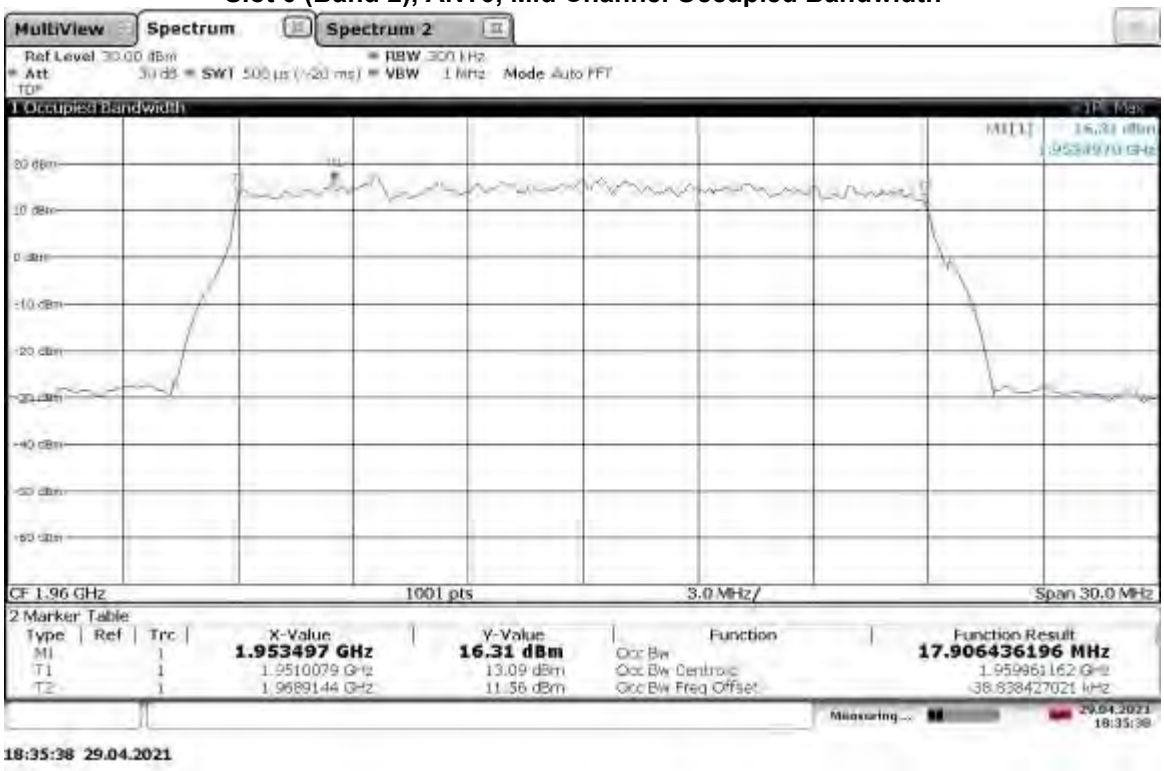
18:34:04 29.04.2021

TM3.2-16QAM_20 MHz Bandwidth
Slot 0 (Band 2), ANT1, Low Channel Occupied Bandwidth

18:32:40 29.04.2021

TM3.2-16QAM_20 MHz Bandwidth

Slot 0 (Band 2), ANT0, Mid Channel Occupied Bandwidth



18:35:38 29.04.2021

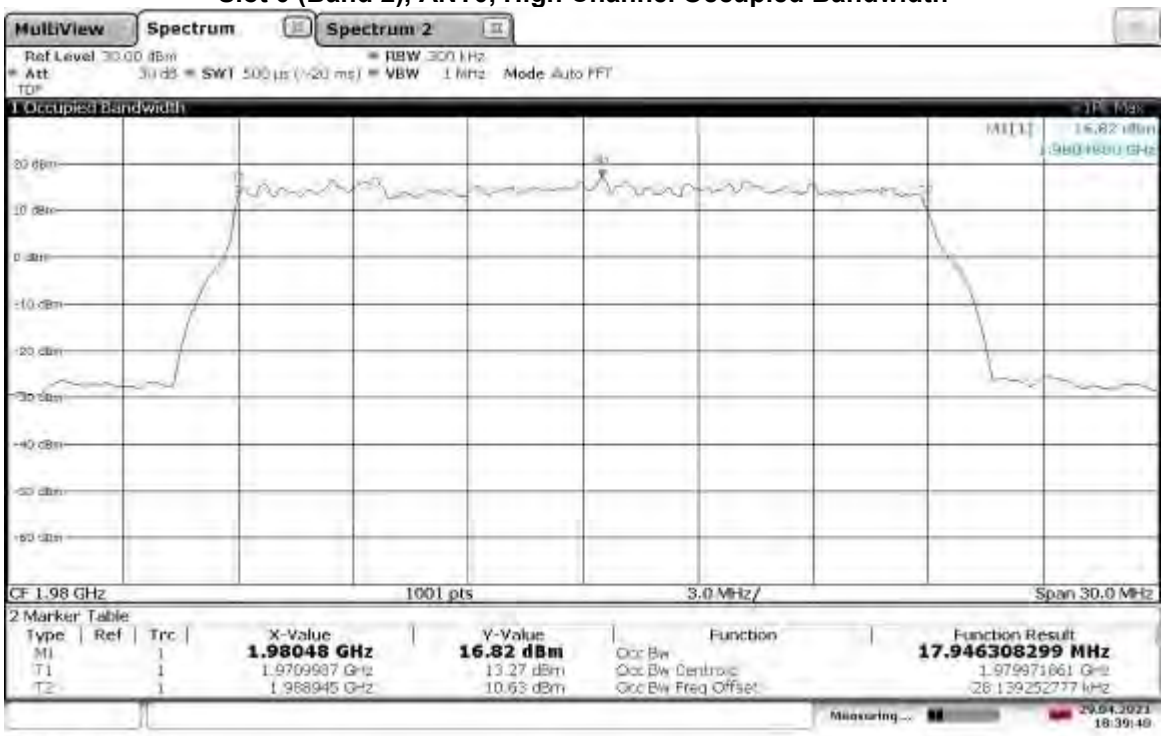
TM3.2-16QAM_20 MHz Bandwidth

Slot 0 (Band 2), ANT1, Mid Channel Occupied Bandwidth

18:37:01 29.04.2021

TM3.2-16QAM_20 MHz Bandwidth

Slot 0 (Band 2), ANT0, High Channel Occupied Bandwidth



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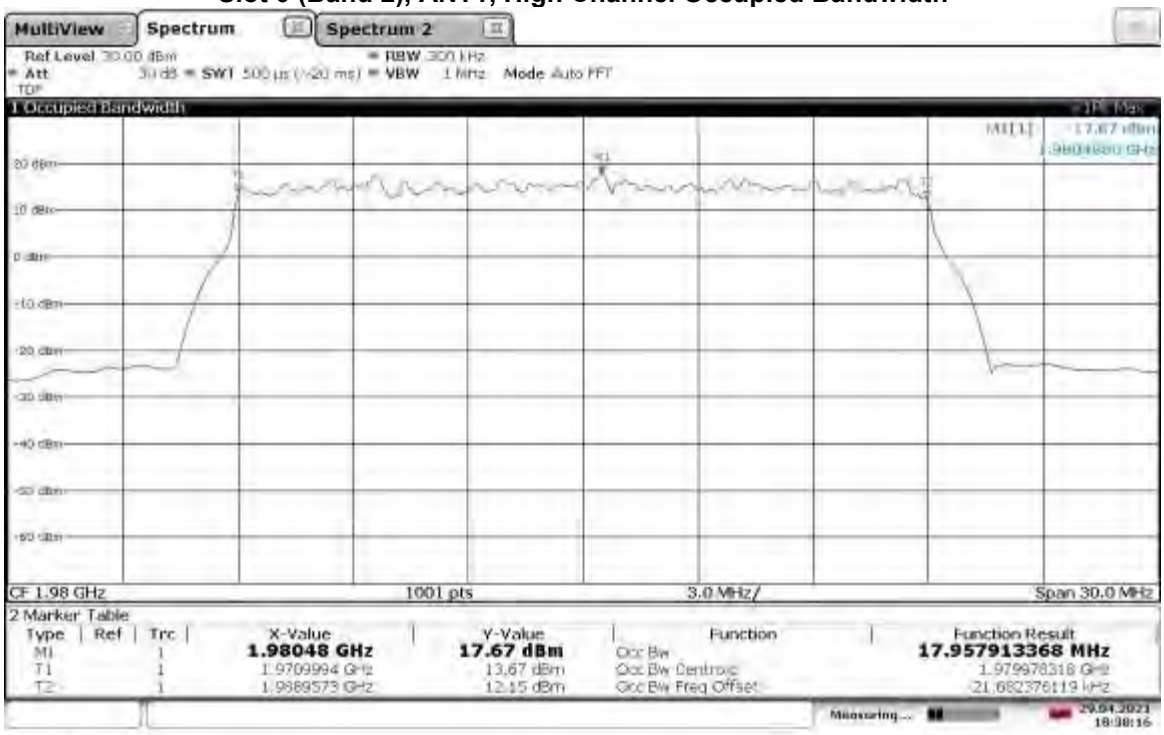
TM3.2-16QAM_20 MHz Bandwidth

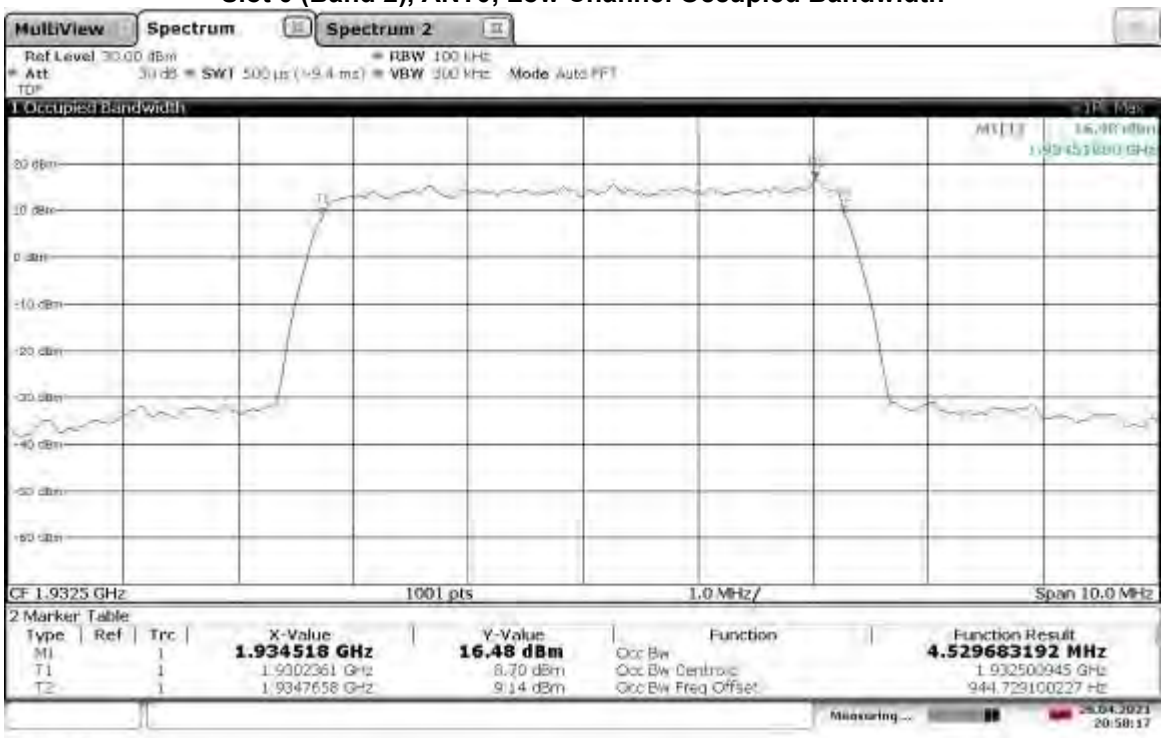
Slot 0 (Band 2), ANT1, High Channel Occupied Bandwidth



18:38:17 29.04.2021

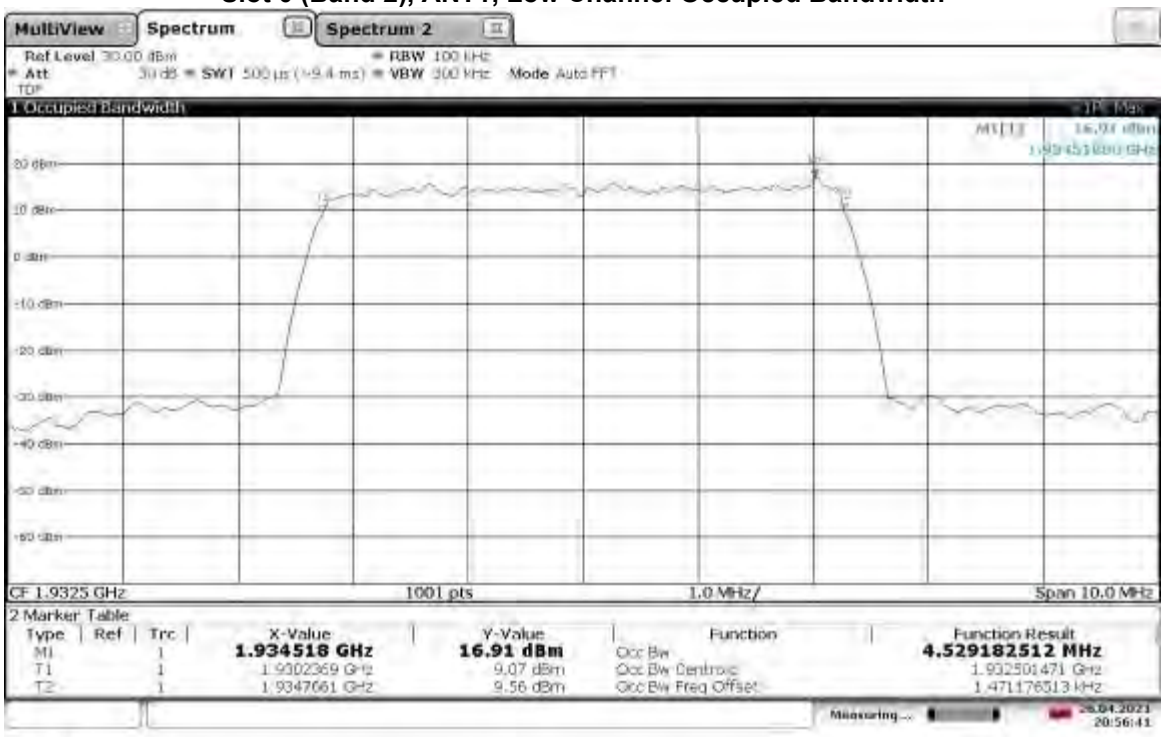
TM3.1-64QAM_5 MHz Bandwidth

Slot 0 (Band 2), ANT0, Low Channel Occupied Bandwidth



TM3.1-64QAM_5 MHz Bandwidth

Slot 0 (Band 2), ANT1, Low Channel Occupied Bandwidth



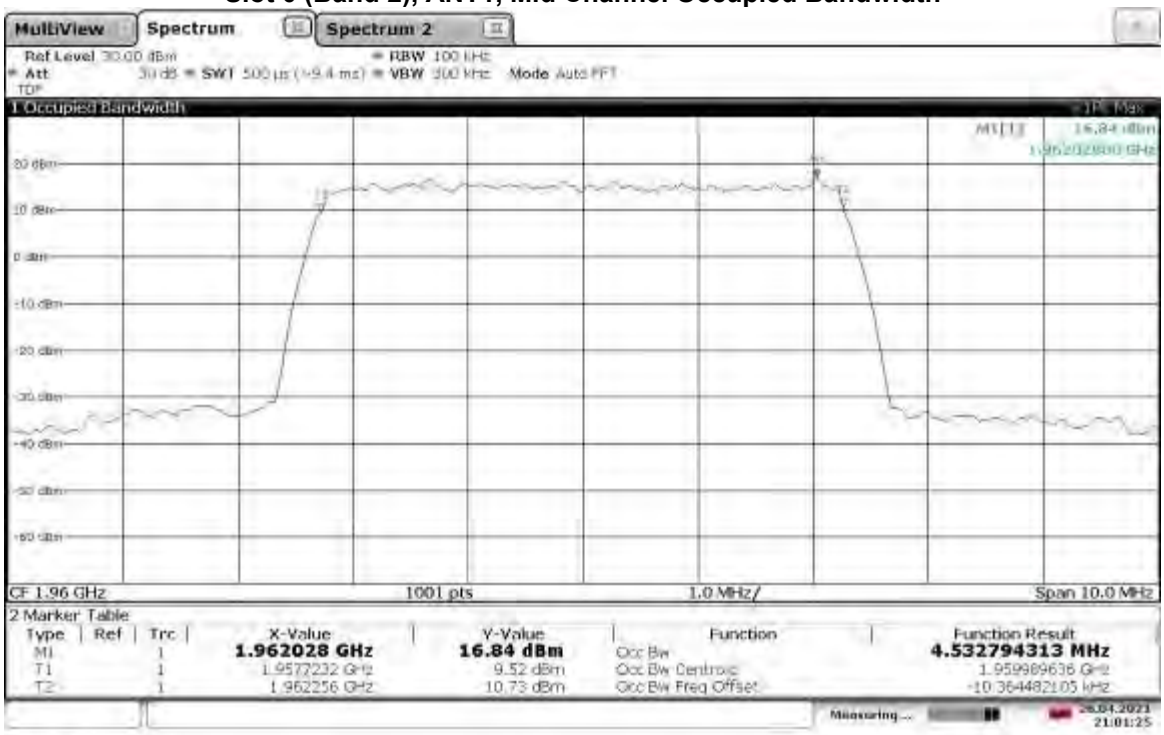
TM3.1-64QAM_5 MHz Bandwidth

Slot 0 (Band 2), ANT0, Mid Channel Occupied Bandwidth

20:59:40 26.04.2021

TM3.1-64QAM_5 MHz Bandwidth

Slot 0 (Band 2), ANT1, Mid Channel Occupied Bandwidth



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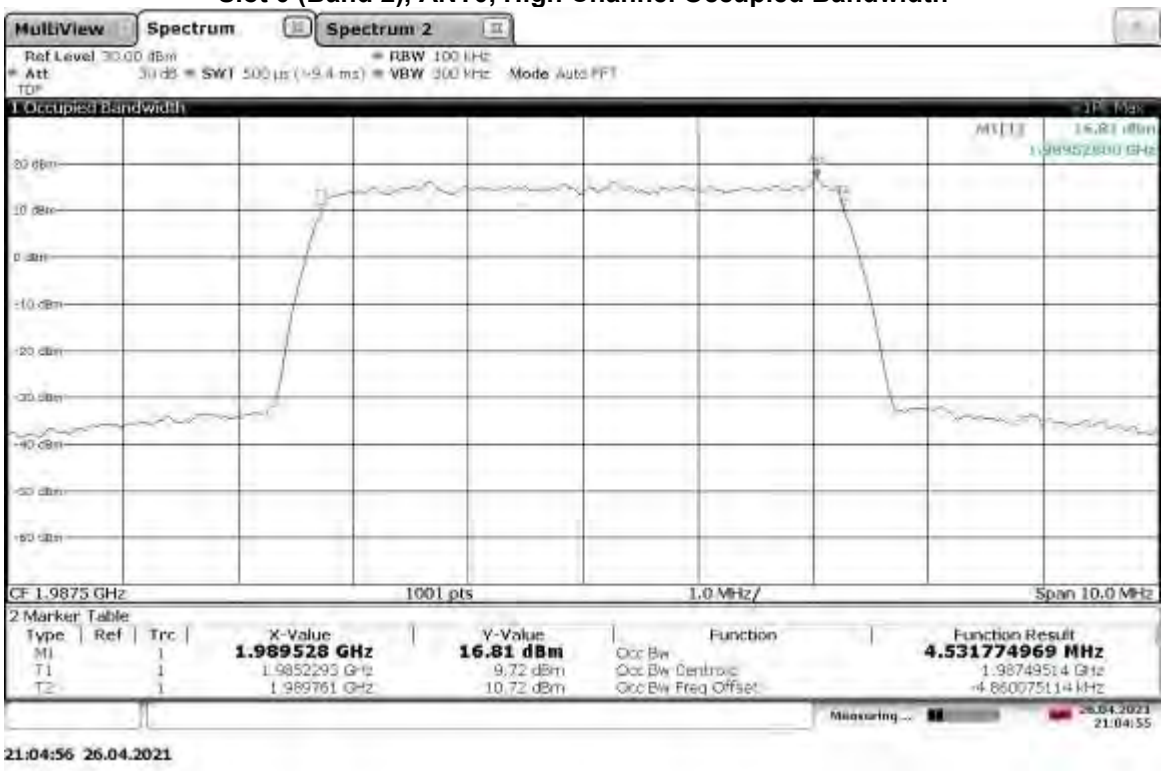
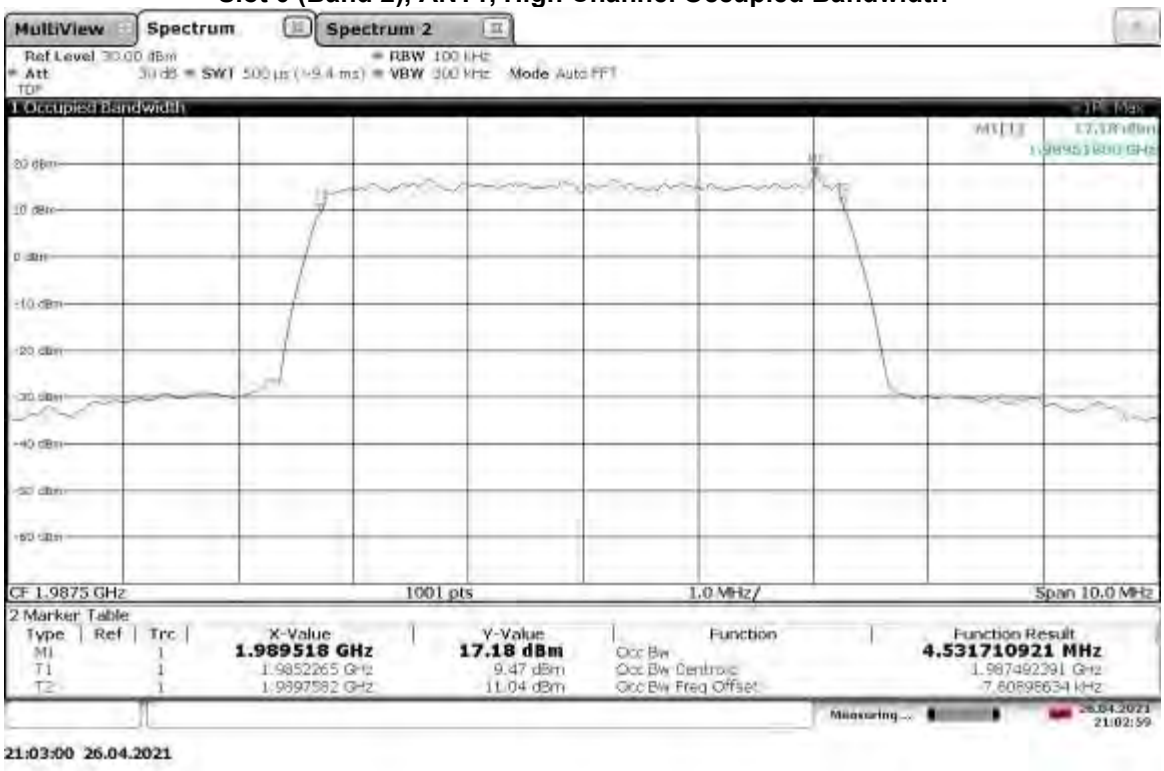
TM3.1-64QAM_5 MHz Bandwidth

Slot 0 (Band 2), ANT0, High Channel Occupied Bandwidth

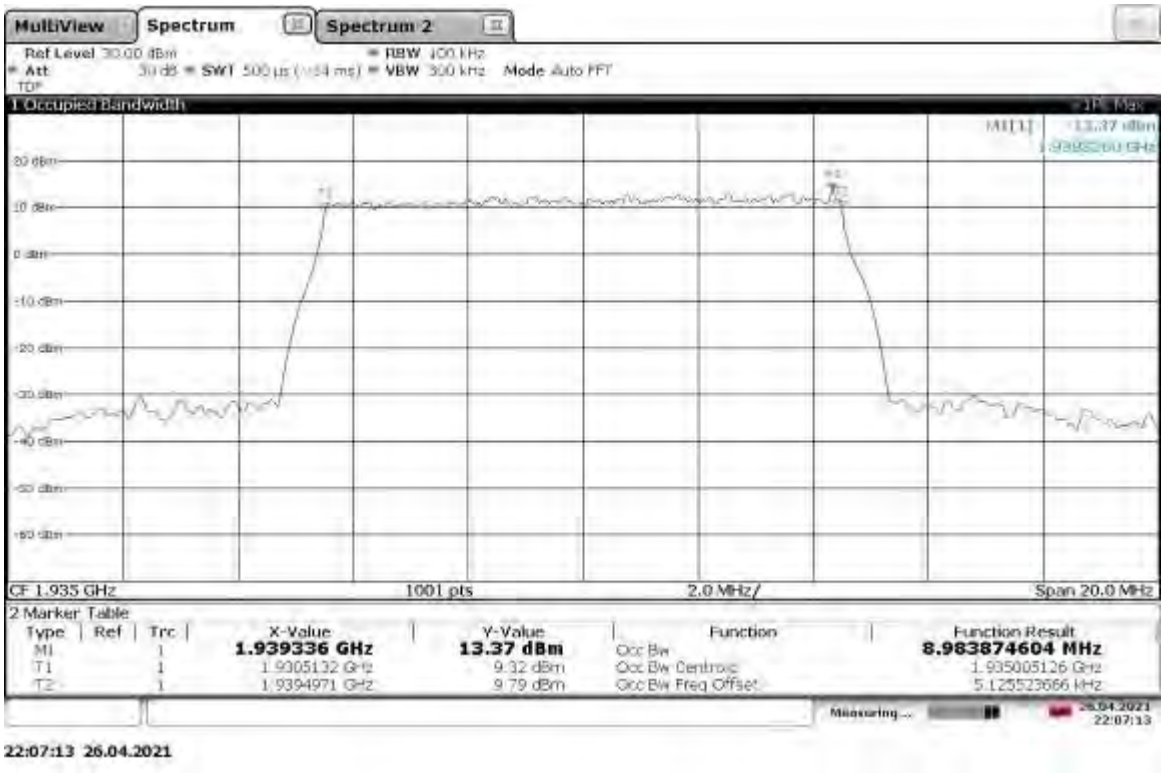


TM3.1-64QAM_5 MHz Bandwidth

Slot 0 (Band 2), ANT1, High Channel Occupied Bandwidth



TM3.1-64QAM_10 MHz Bandwidth
Slot 0 (Band 2), ANT0, Low Channel Occupied Bandwidth



TM3.1-64QAM_10 MHz Bandwidth

Slot 0 (Band 2), ANT1, Low Channel Occupied Bandwidth

TM3.1-64QAM_10 MHz Bandwidth

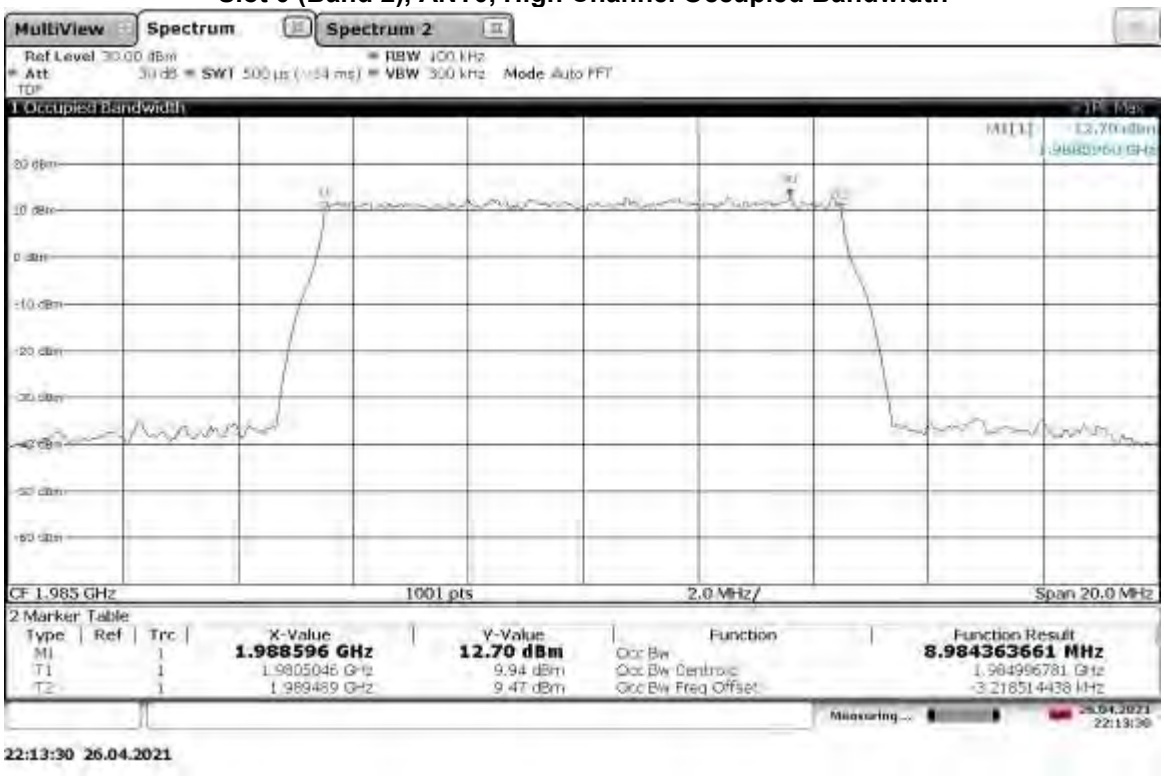
Slot 0 (Band 2), ANT0, Mid Channel Occupied Bandwidth

TM3.1-64QAM_10 MHz Bandwidth

Slot 0 (Band 2), ANT1, Mid Channel Occupied Bandwidth

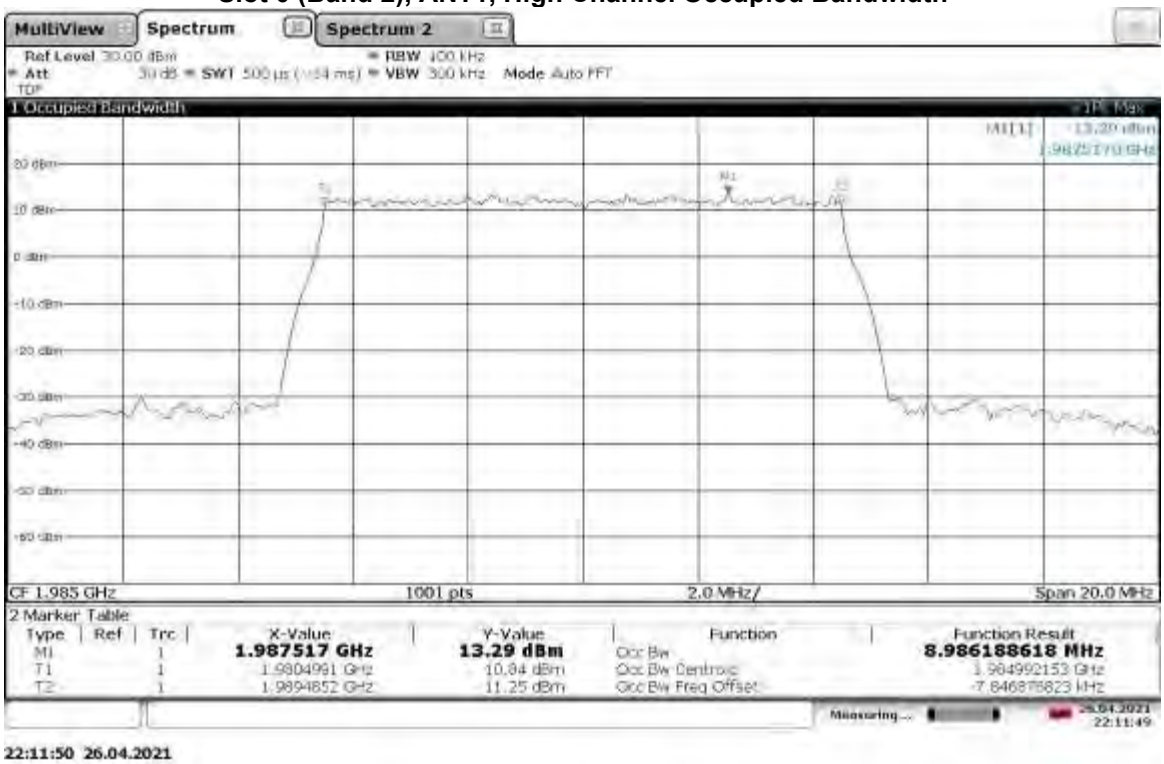
TM3.1-64QAM_10 MHz Bandwidth

Slot 0 (Band 2), ANT0, High Channel Occupied Bandwidth



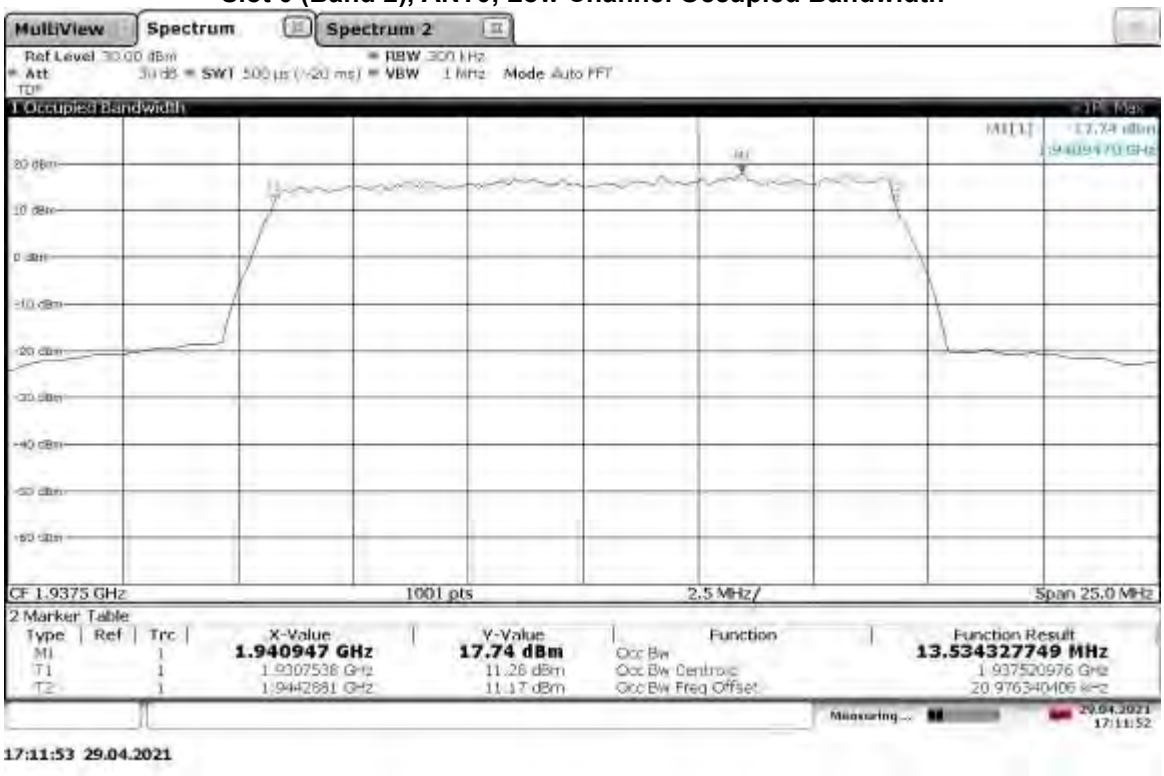
TM3.1-64QAM_10 MHz Bandwidth

Slot 0 (Band 2), ANT1, High Channel Occupied Bandwidth



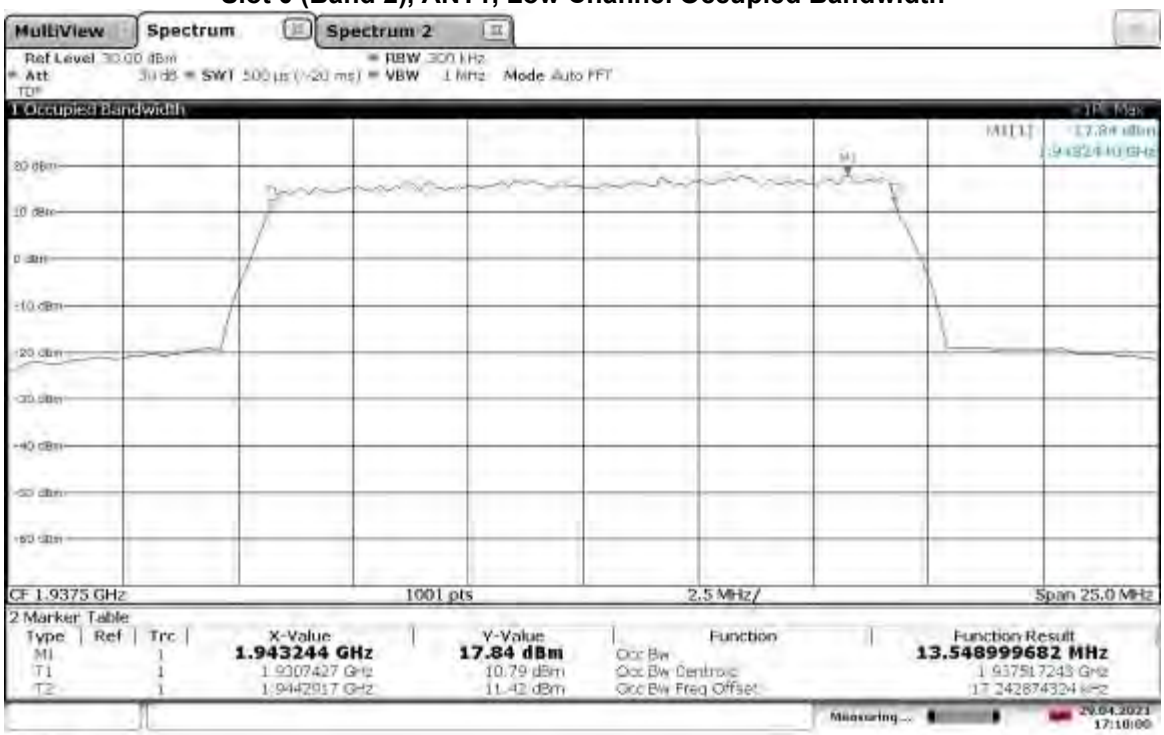
TM3.1-64QAM_15 MHz Bandwidth

Slot 0 (Band 2), ANT0, Low Channel Occupied Bandwidth



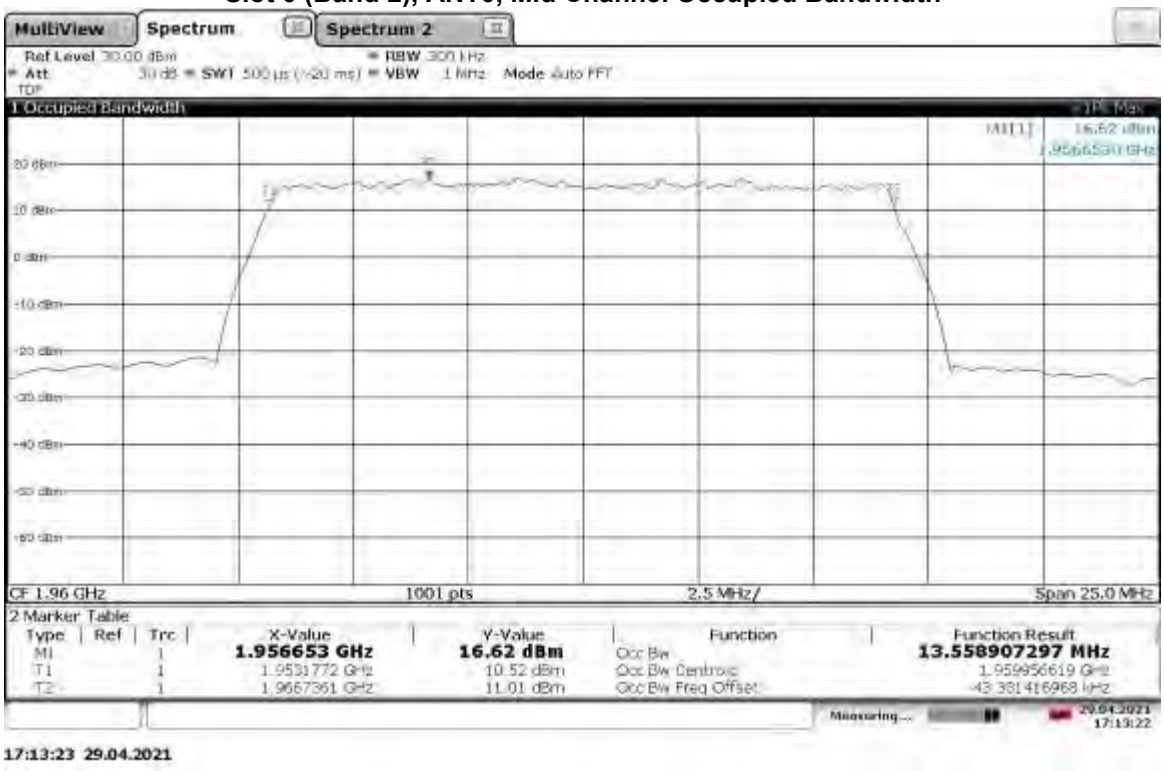
TM3.1-64QAM_15 MHz Bandwidth

Slot 0 (Band 2), ANT1, Low Channel Occupied Bandwidth



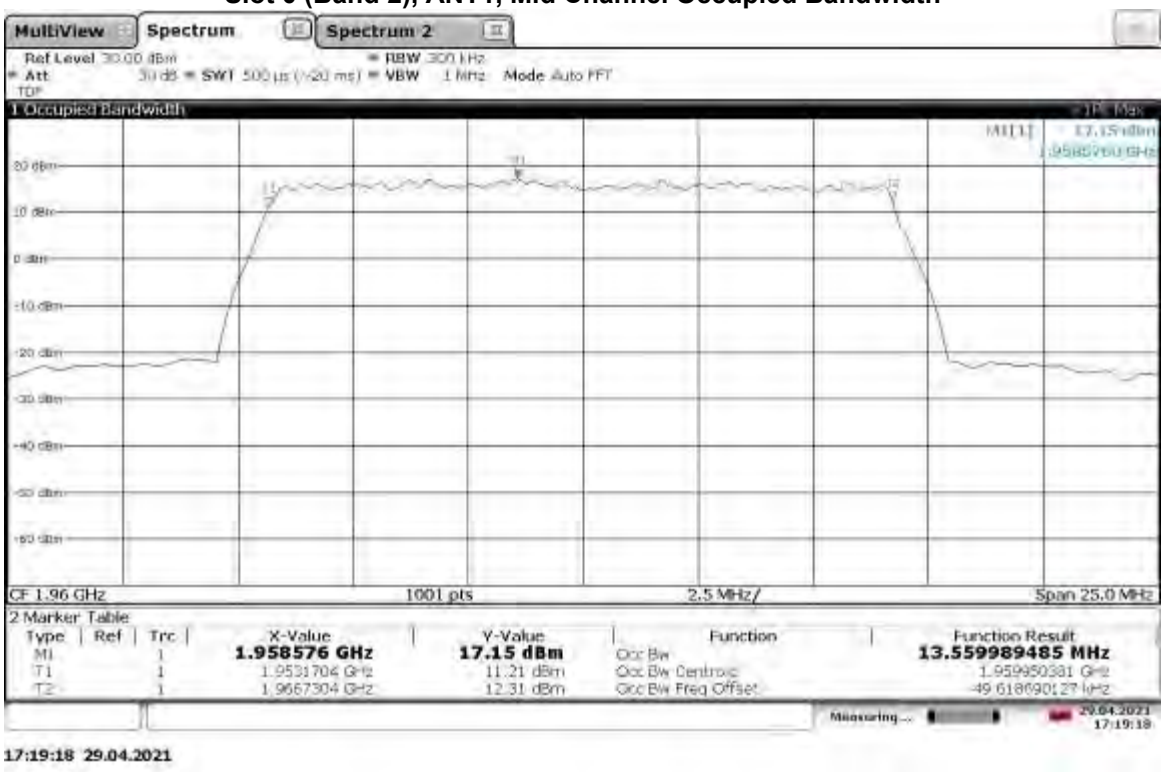
TM3.1-64QAM_15 MHz Bandwidth

Slot 0 (Band 2), ANT0, Mid Channel Occupied Bandwidth



TM3.1-64QAM_15 MHz Bandwidth

Slot 0 (Band 2), ANT1, Mid Channel Occupied Bandwidth



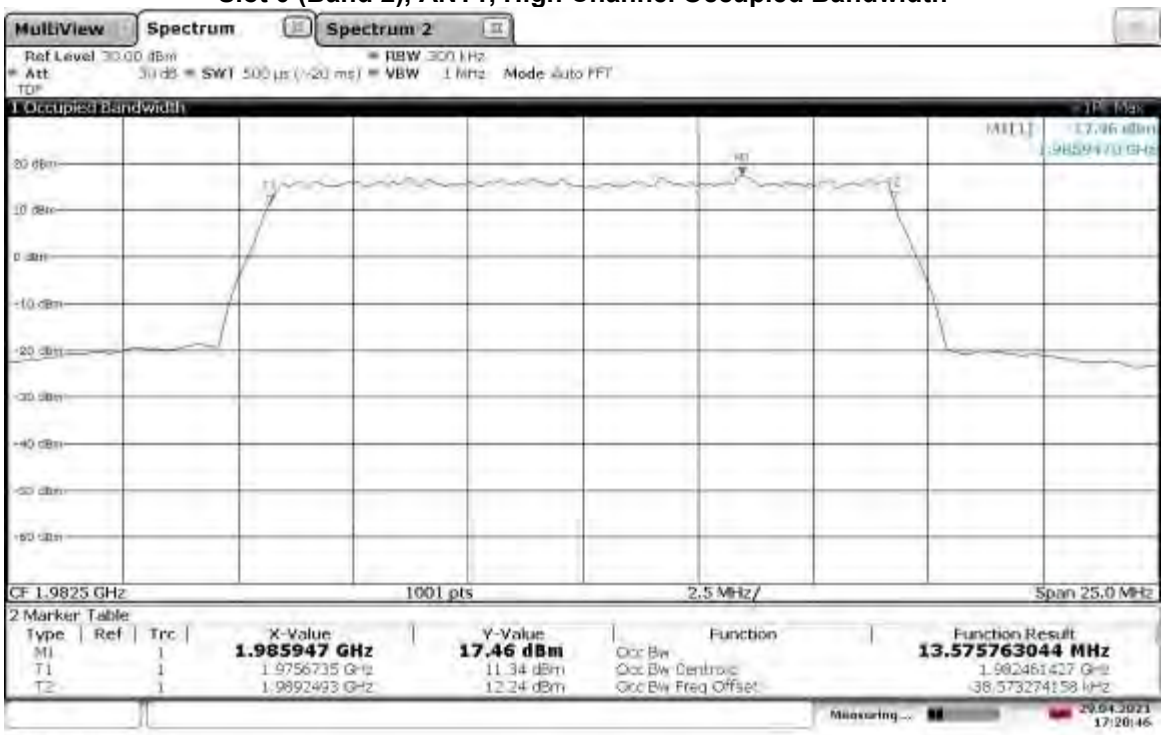
TM3.1-64QAM_15 MHz Bandwidth

Slot 0 (Band 2), ANT0, High Channel Occupied Bandwidth

17:23:27 29.04.2021

TM3.1-64QAM_15 MHz Bandwidth

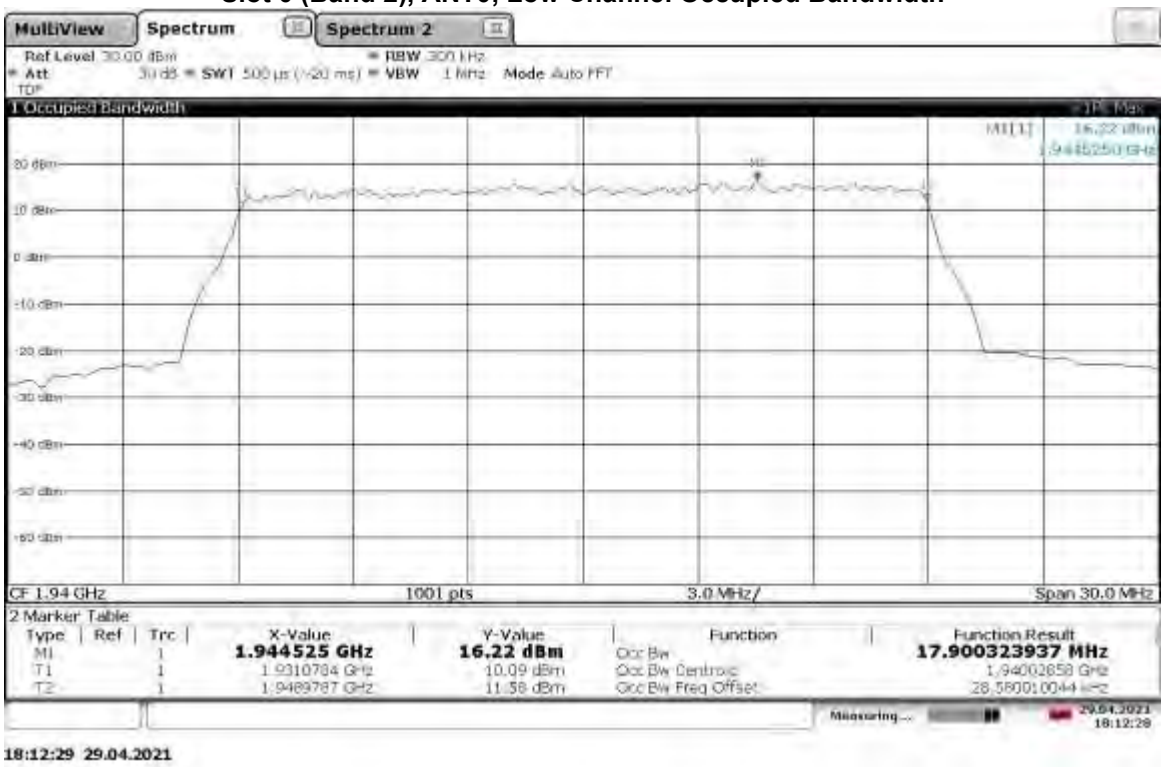
Slot 0 (Band 2), ANT1, High Channel Occupied Bandwidth



17:20:46 29.04.2021

TM3.1-64QAM_20 MHz Bandwidth

Slot 0 (Band 2), ANT0, Low Channel Occupied Bandwidth



18:12:29 29.04.2021

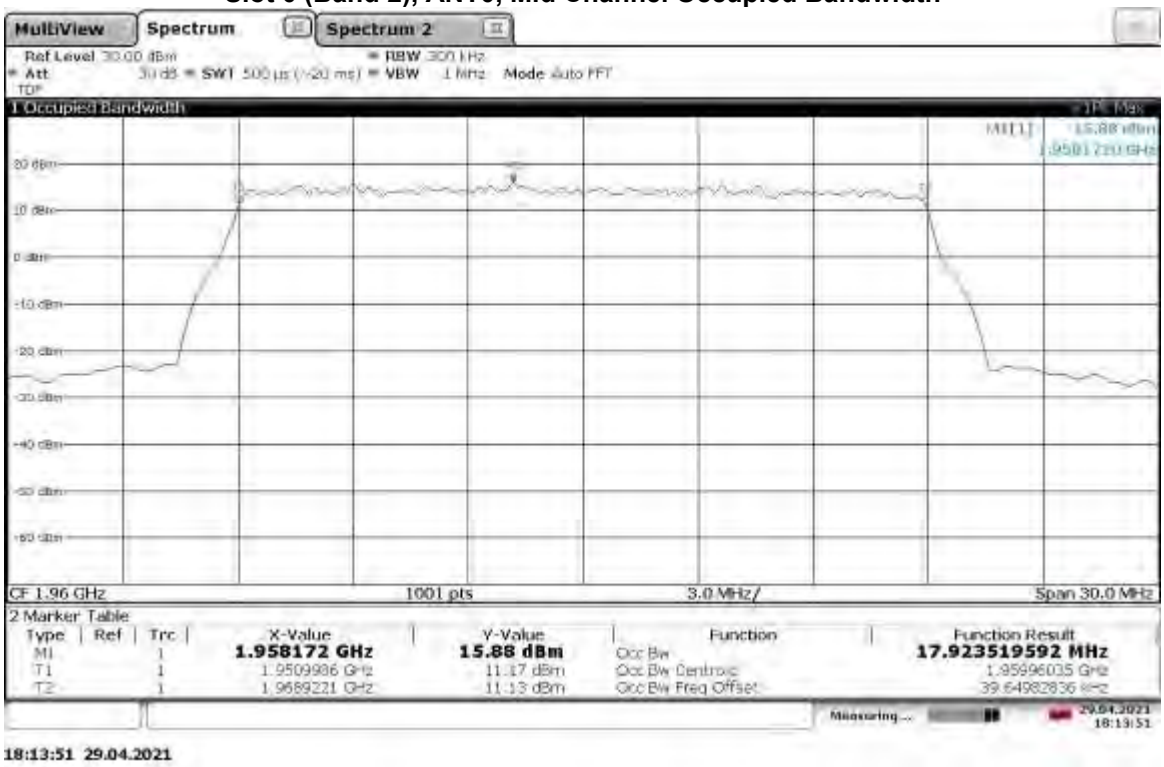
TM3.1-64QAM_20 MHz Bandwidth

Slot 0 (Band 2), ANT1, Low Channel Occupied Bandwidth

18:09:52 29.04.2021

TM3.1-64QAM_20 MHz Bandwidth

Slot 0 (Band 2), ANT0, Mid Channel Occupied Bandwidth



18:13:51 29.04.2021

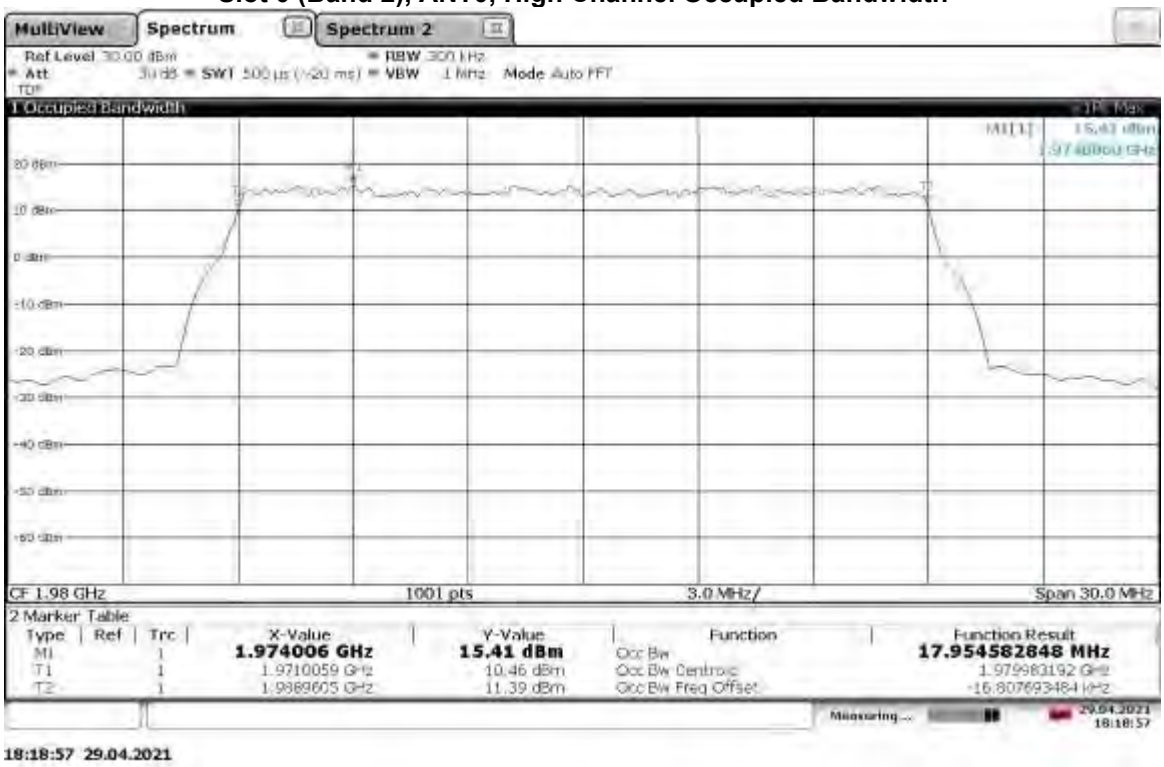
TM3.1-64QAM_20 MHz Bandwidth

Slot 0 (Band 2), ANT1, Mid Channel Occupied Bandwidth

18:15:16 29.04.2021

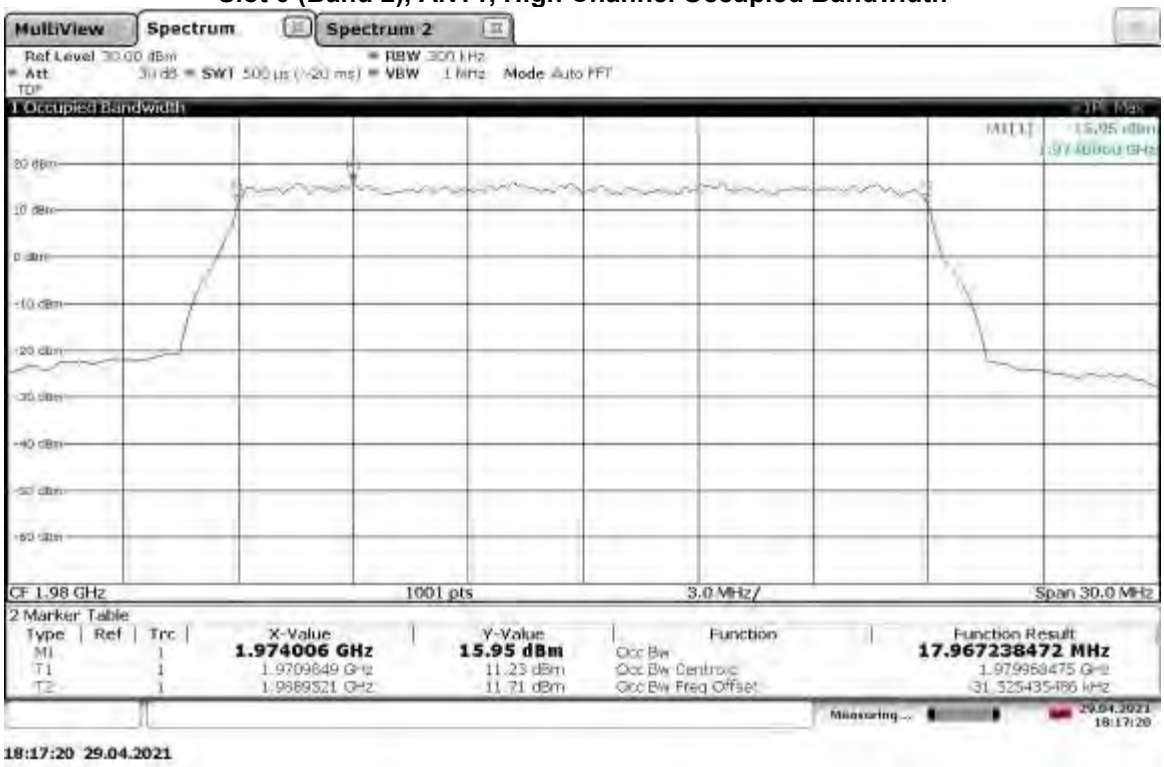
TM3.1-64QAM_20 MHz Bandwidth

Slot 0 (Band 2), ANT0, High Channel Occupied Bandwidth



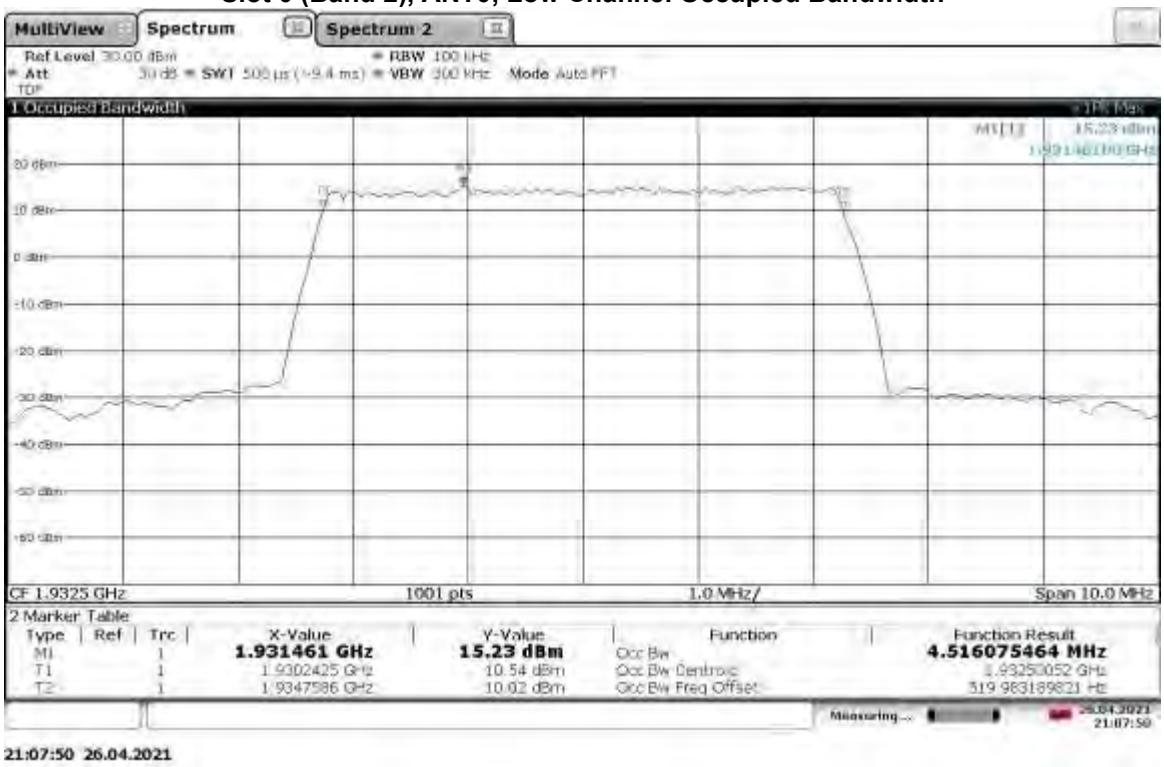
TM3.1-64QAM_20 MHz Bandwidth

Slot 0 (Band 2), ANT1, High Channel Occupied Bandwidth



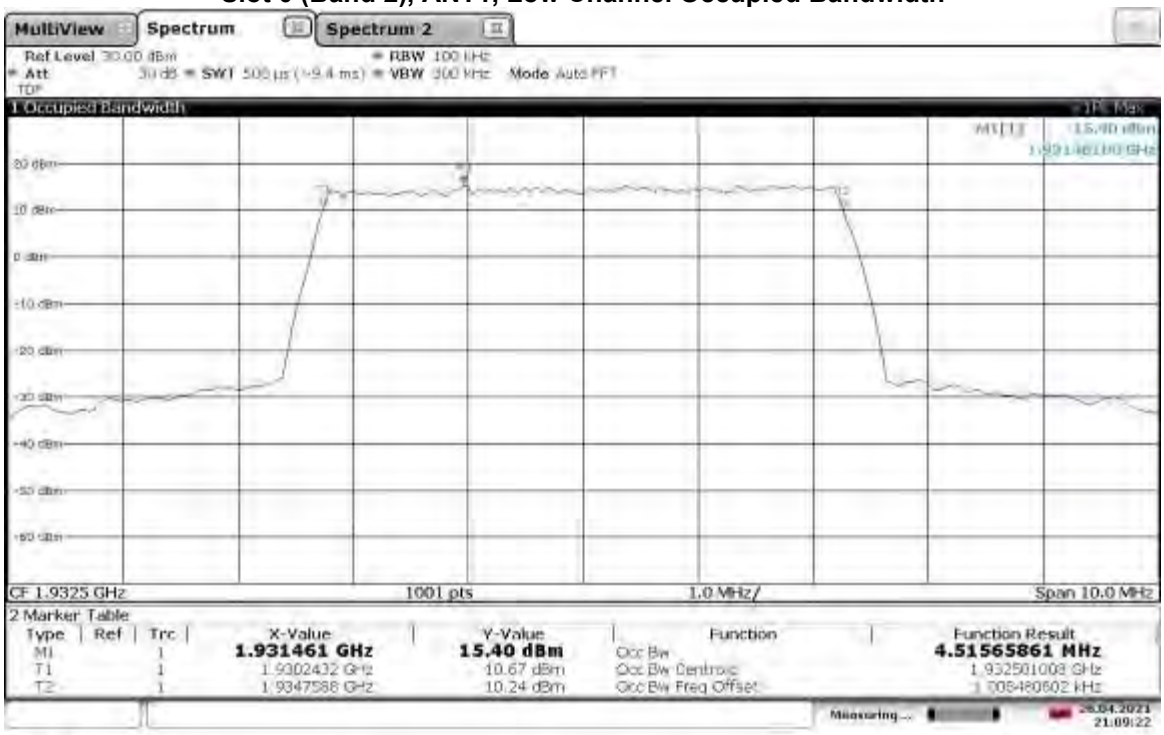
TM3.1a-256QAM_5 MHz Bandwidth

Slot 0 (Band 2), ANT0, Low Channel Occupied Bandwidth



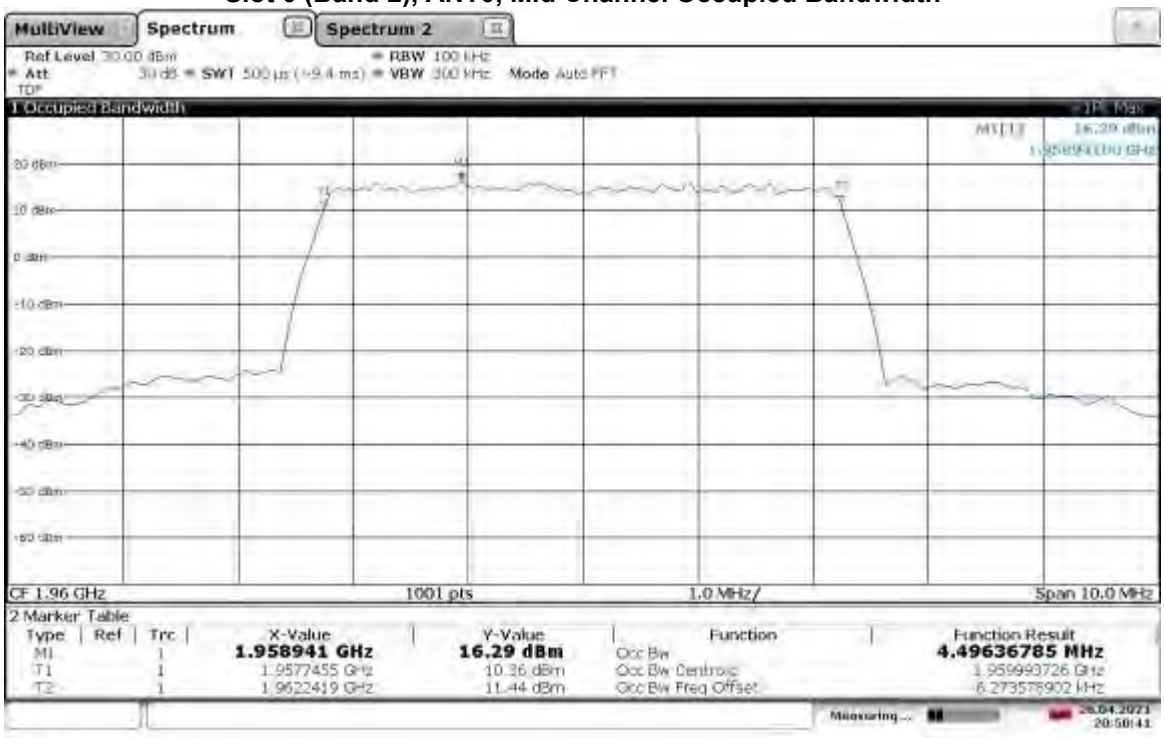
TM3.1a-256QAM_5 MHz Bandwidth

Slot 0 (Band 2), ANT1, Low Channel Occupied Bandwidth



TM3.1a-256QAM_5 MHz Bandwidth

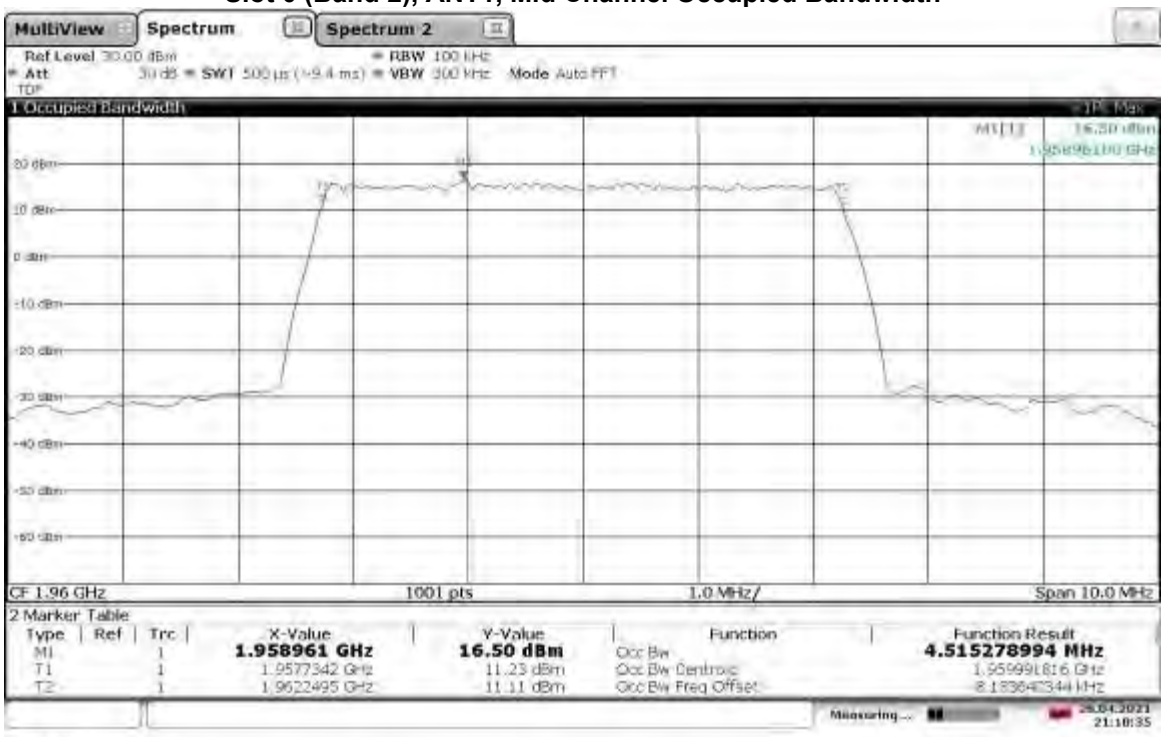
Slot 0 (Band 2), ANT0, Mid Channel Occupied Bandwidth



20:50:41 26.04.2021

TM3.1a-256QAM_5 MHz Bandwidth

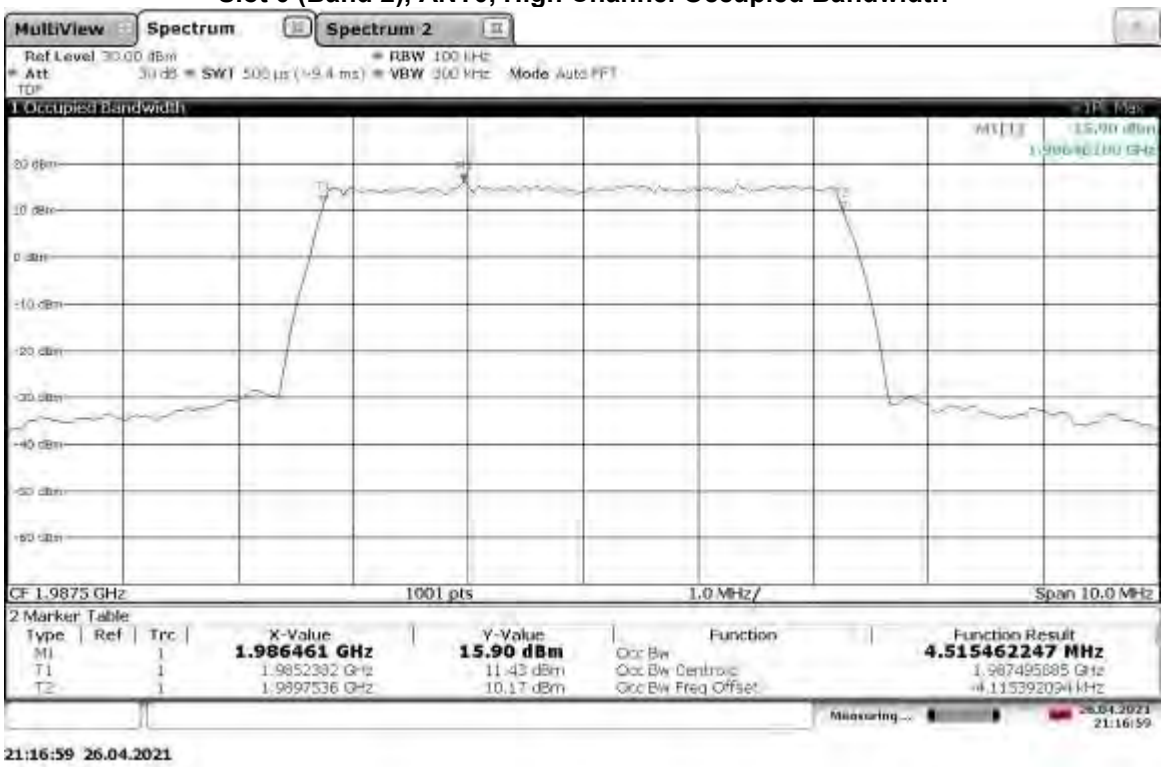
Slot 0 (Band 2), ANT1, Mid Channel Occupied Bandwidth



21:10:35 26.04.2021

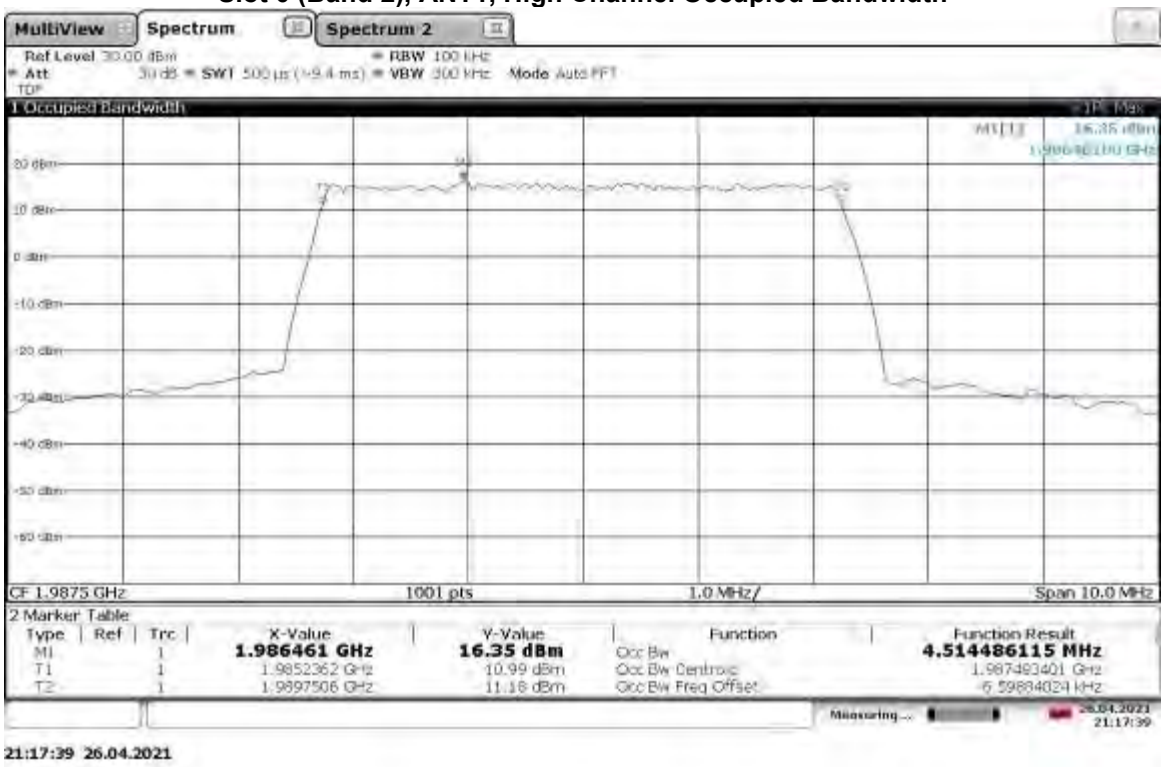
TM3.1a-256QAM_5 MHz Bandwidth

Slot 0 (Band 2), ANT0, High Channel Occupied Bandwidth



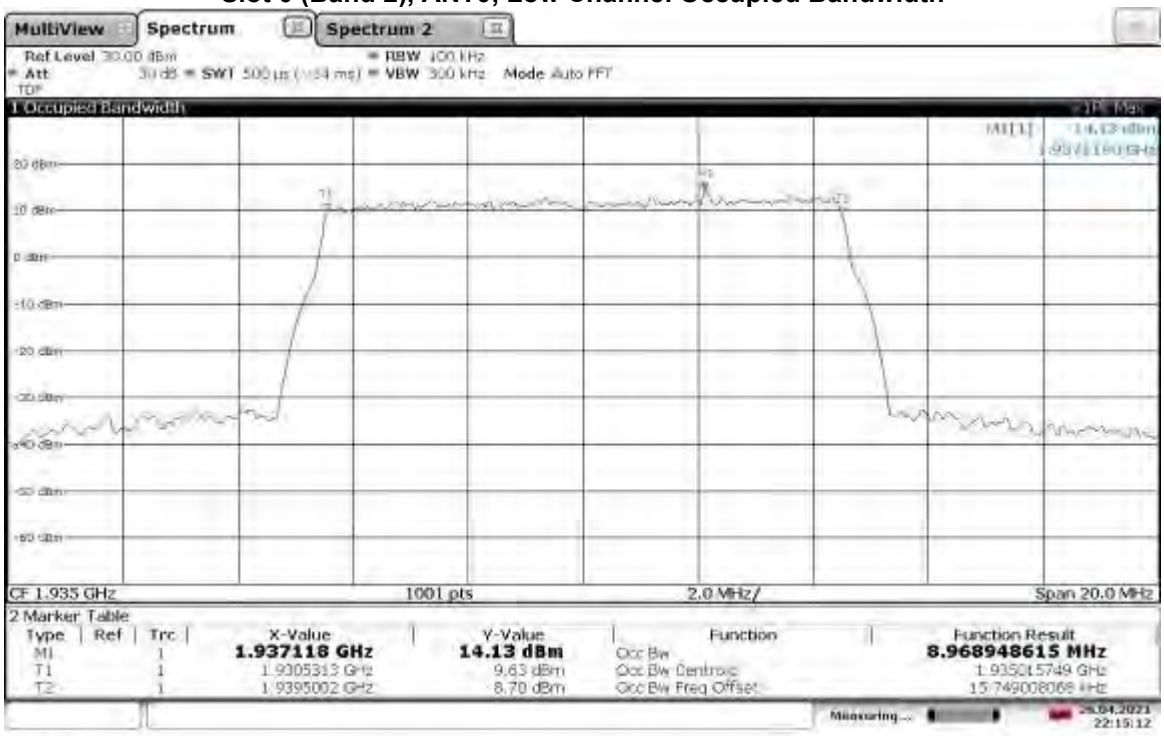
TM3.1a-256QAM_5 MHz Bandwidth

Slot 0 (Band 2), ANT1, High Channel Occupied Bandwidth



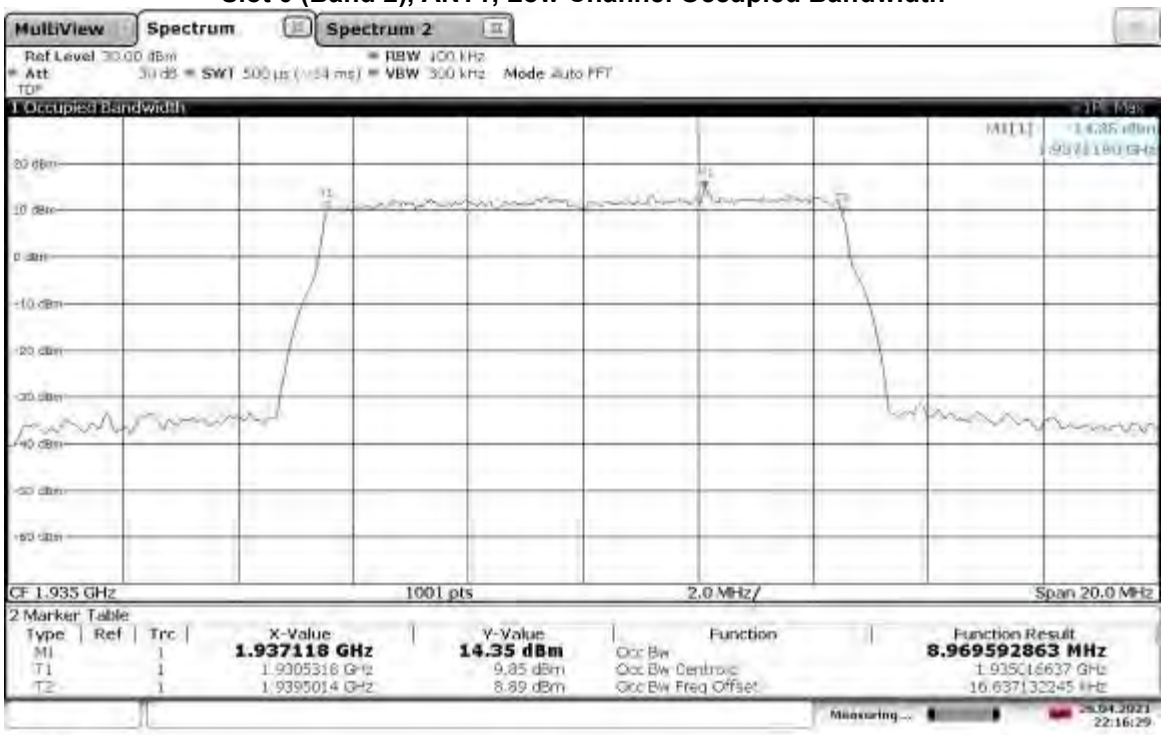
TM3.1a-256QAM_10 MHz Bandwidth

Slot 0 (Band 2), ANT0, Low Channel Occupied Bandwidth



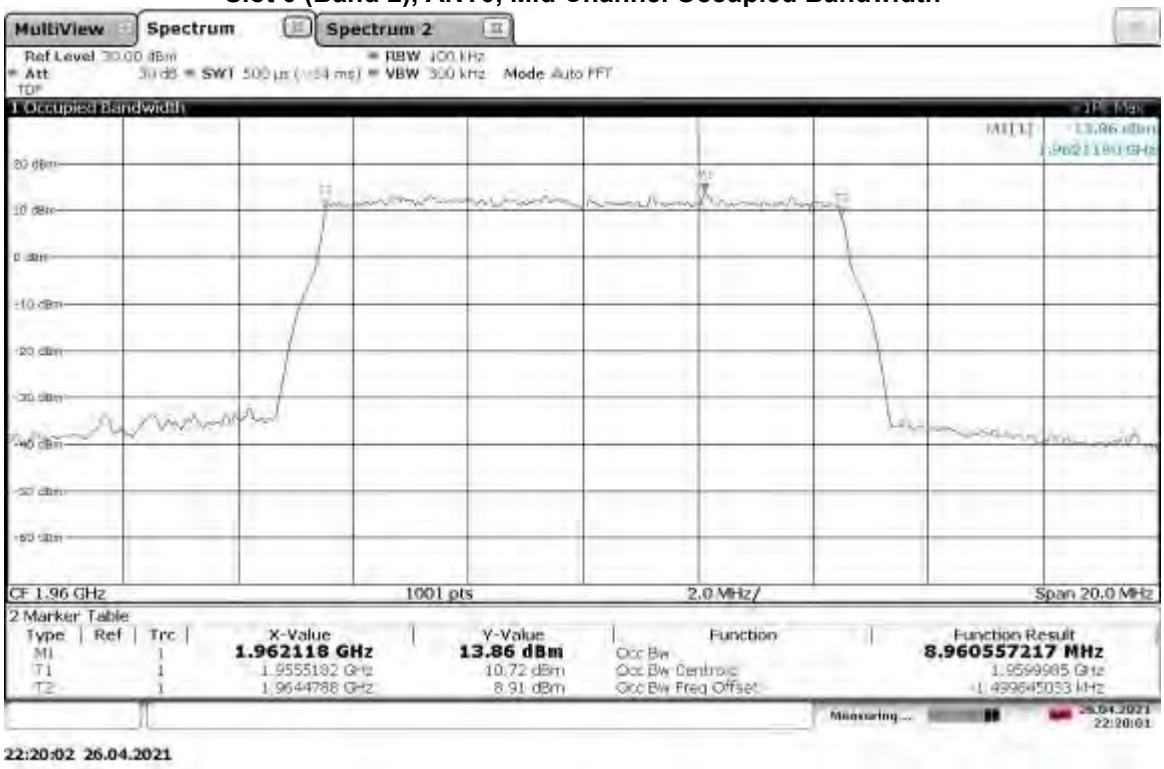
TM3.1a-256QAM_10 MHz Bandwidth

Slot 0 (Band 2), ANT1, Low Channel Occupied Bandwidth



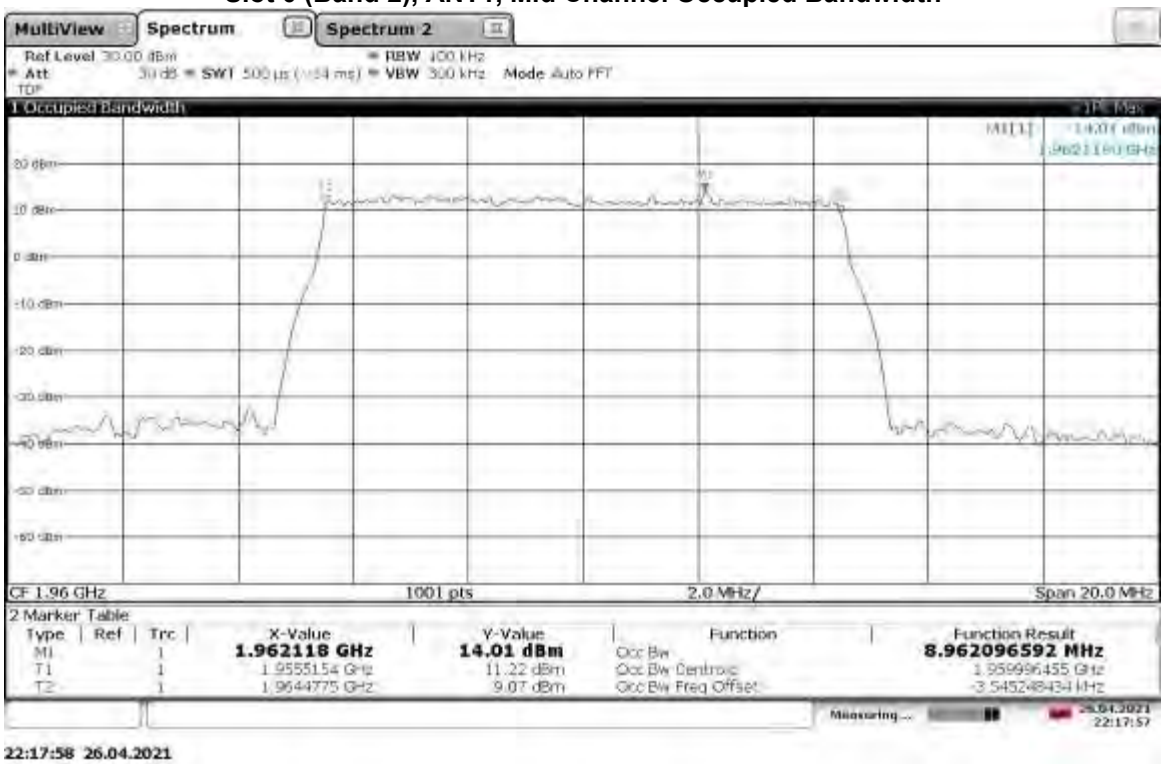
TM3.1a-256QAM_10 MHz Bandwidth

Slot 0 (Band 2), ANT0, Mid Channel Occupied Bandwidth



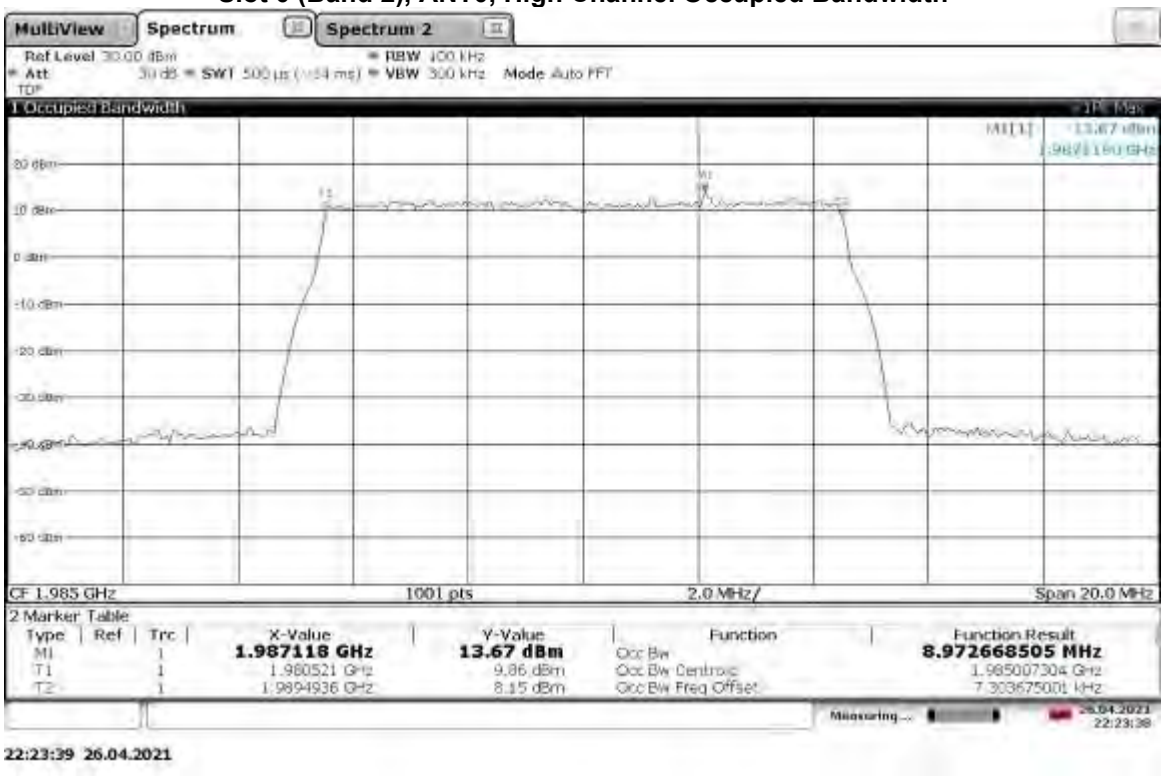
TM3.1a-256QAM_10 MHz Bandwidth

Slot 0 (Band 2), ANT1, Mid Channel Occupied Bandwidth



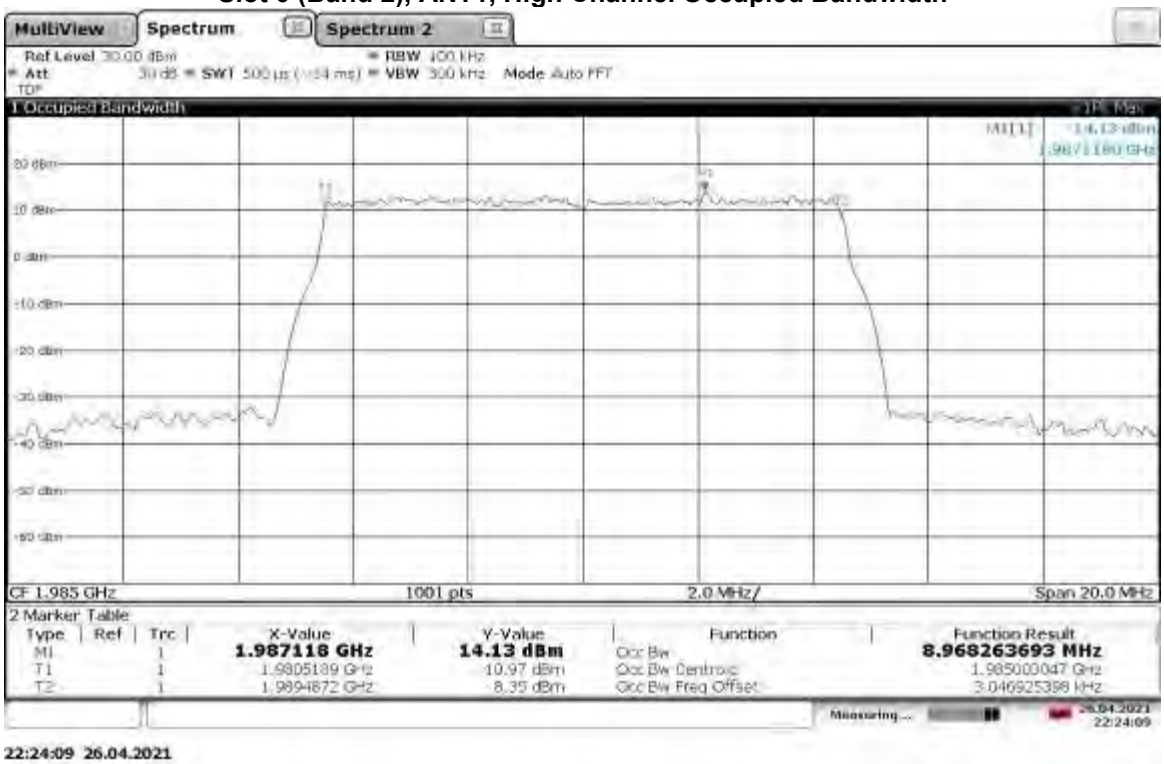
TM3.1a-256QAM_10 MHz Bandwidth

Slot 0 (Band 2), ANT0, High Channel Occupied Bandwidth



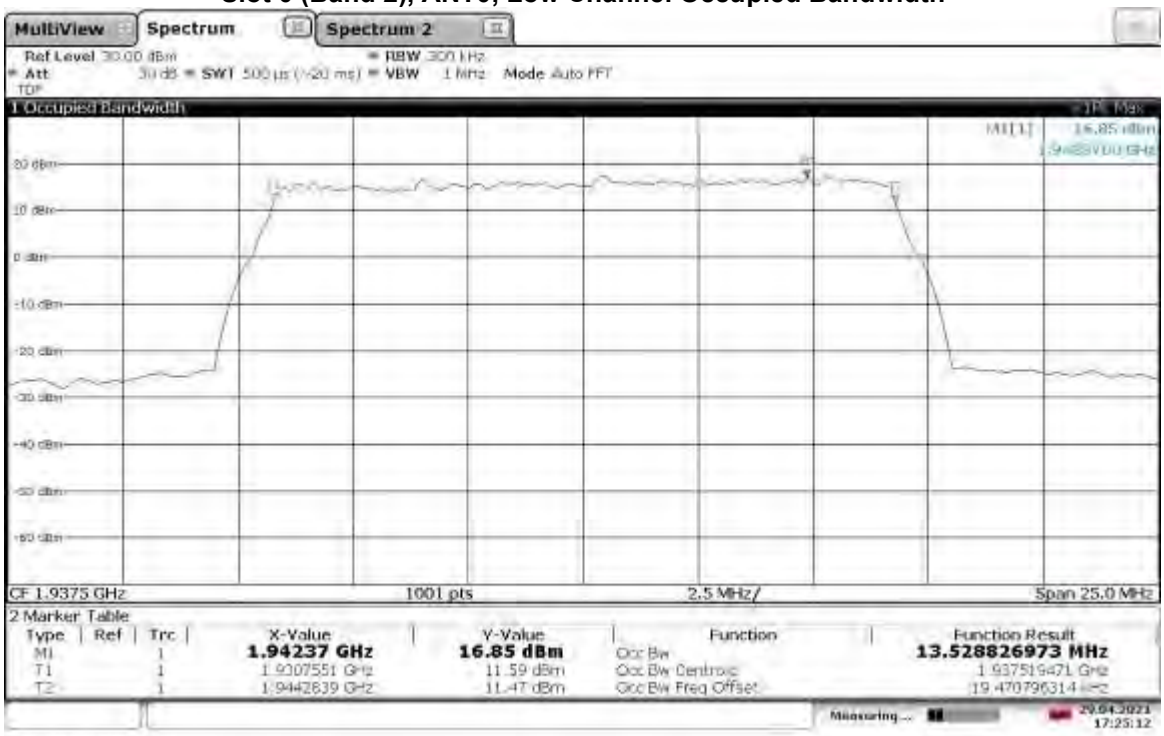
TM3.1a-256QAM_10 MHz Bandwidth

Slot 0 (Band 2), ANT1, High Channel Occupied Bandwidth



TM3.1a-256QAM_15 MHz Bandwidth

Slot 0 (Band 2), ANT0, Low Channel Occupied Bandwidth

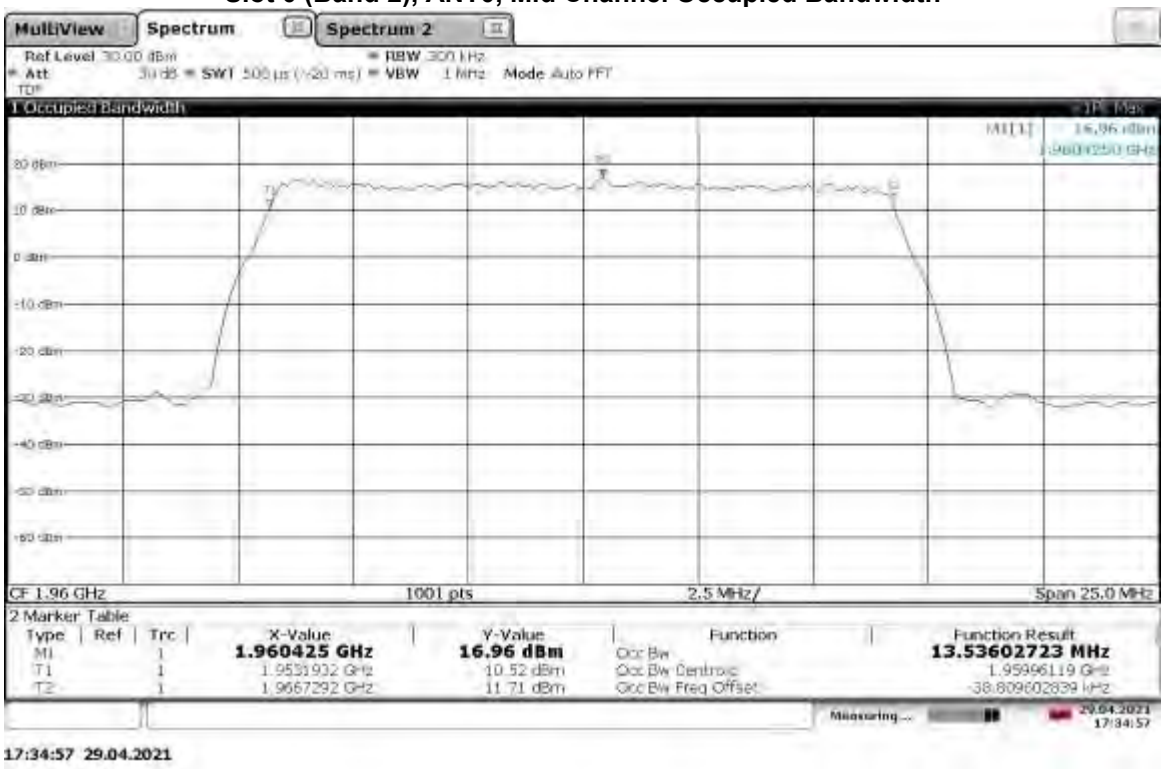


TM3.1a-256QAM_15 MHz Bandwidth

Slot 0 (Band 2), ANT1, Low Channel Occupied Bandwidth

TM3.1a-256QAM_15 MHz Bandwidth

Slot 0 (Band 2), ANT0, Mid Channel Occupied Bandwidth



17:34:57 29.04.2021

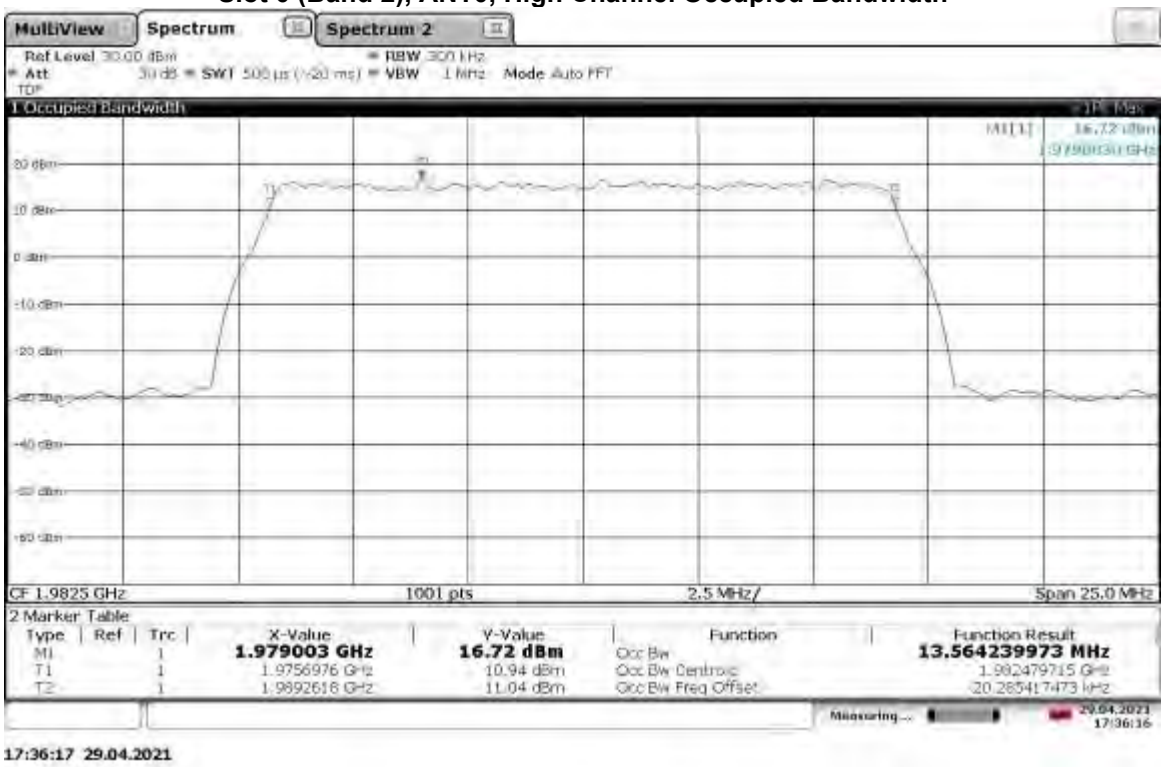
TM3.1a-256QAM_15 MHz Bandwidth

Slot 0 (Band 2), ANT1, Mid Channel Occupied Bandwidth

17:28:55 29.04.2021

TM3.1a-256QAM_15 MHz Bandwidth

Slot 0 (Band 2), ANT0, High Channel Occupied Bandwidth



17:36:17 29.04.2021

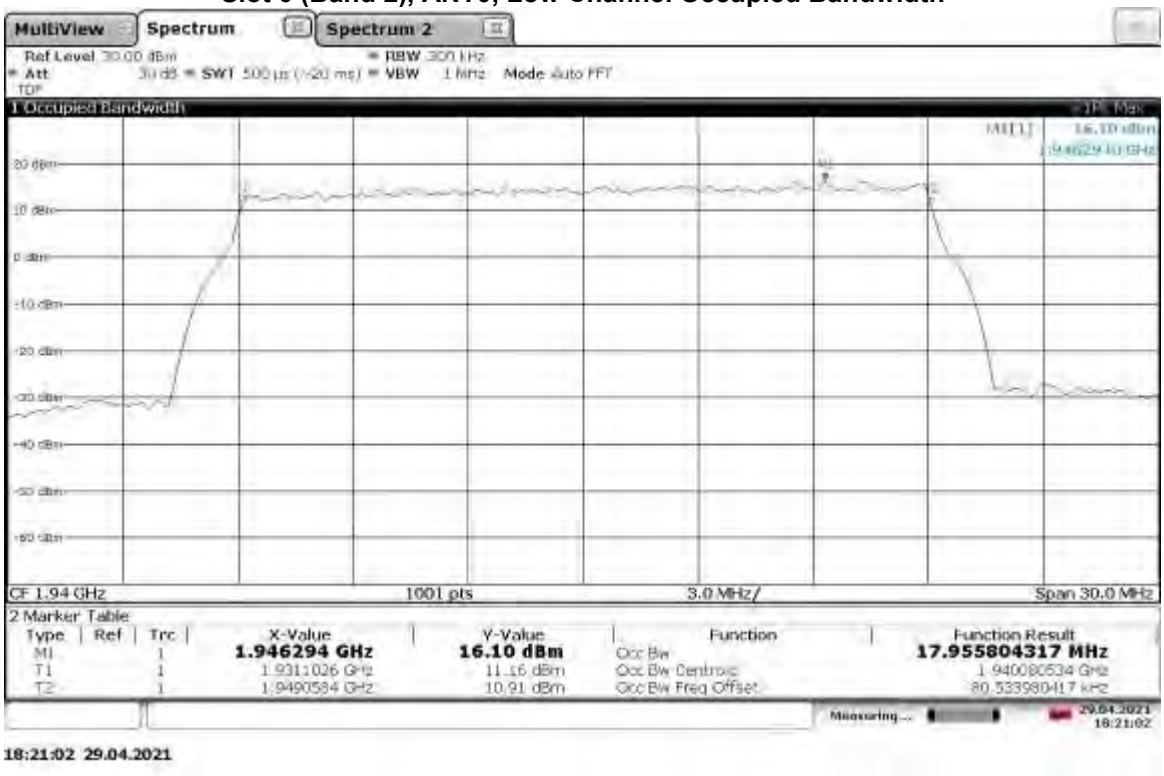
TM3.1a-256QAM_15 MHz Bandwidth

Slot 0 (Band 2), ANT1, High Channel Occupied Bandwidth

17:38:13 29.04.2021

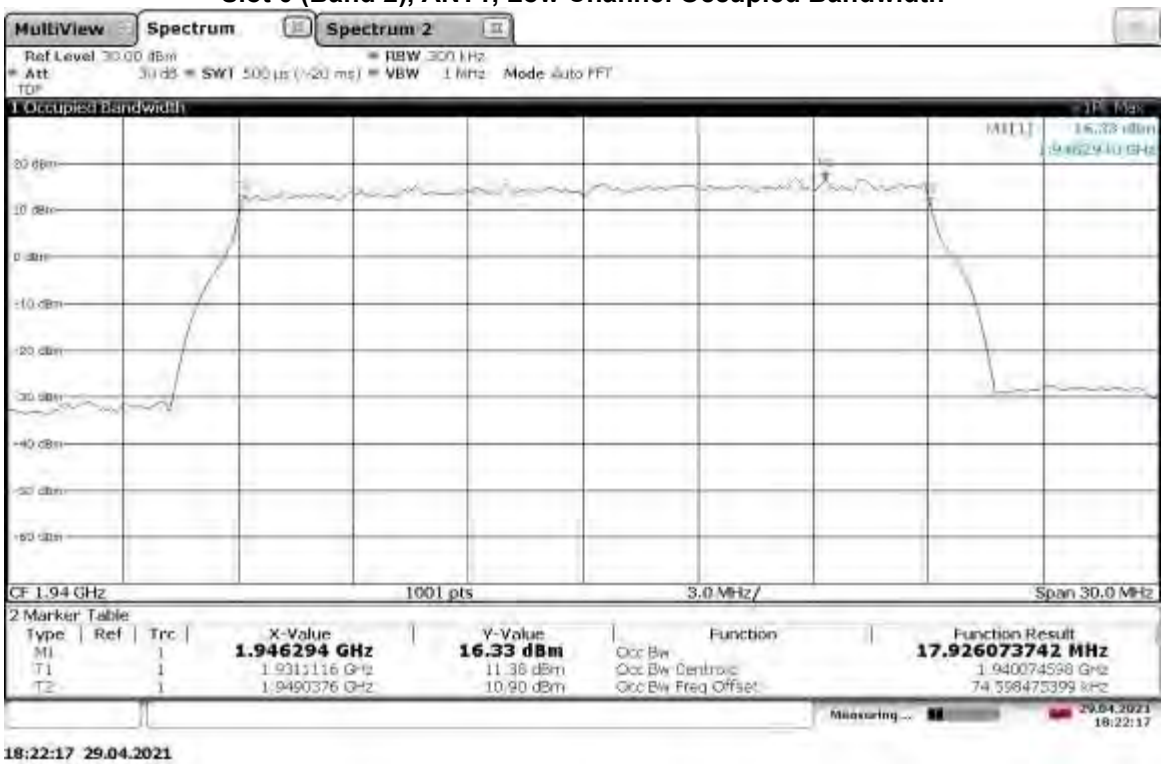
TM3.1a-256QAM_20 MHz Bandwidth

Slot 0 (Band 2), ANT0, Low Channel Occupied Bandwidth



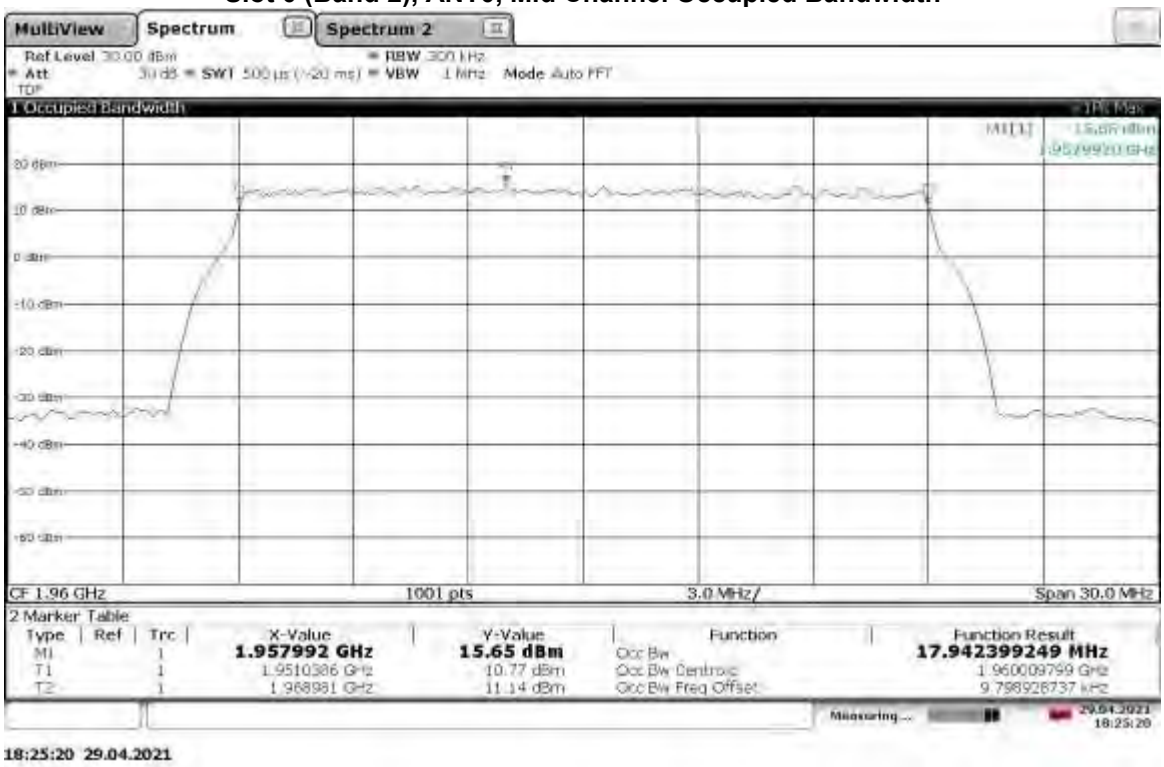
TM3.1a-256QAM_20 MHz Bandwidth

Slot 0 (Band 2), ANT1, Low Channel Occupied Bandwidth



TM3.1a-256QAM_20 MHz Bandwidth

Slot 0 (Band 2), ANT0, Mid Channel Occupied Bandwidth



18:25:20 29.04.2021

TM3.1a-256QAM_20 MHz Bandwidth

Slot 0 (Band 2), ANT1, Mid Channel Occupied Bandwidth

18:23:37 29.04.2021

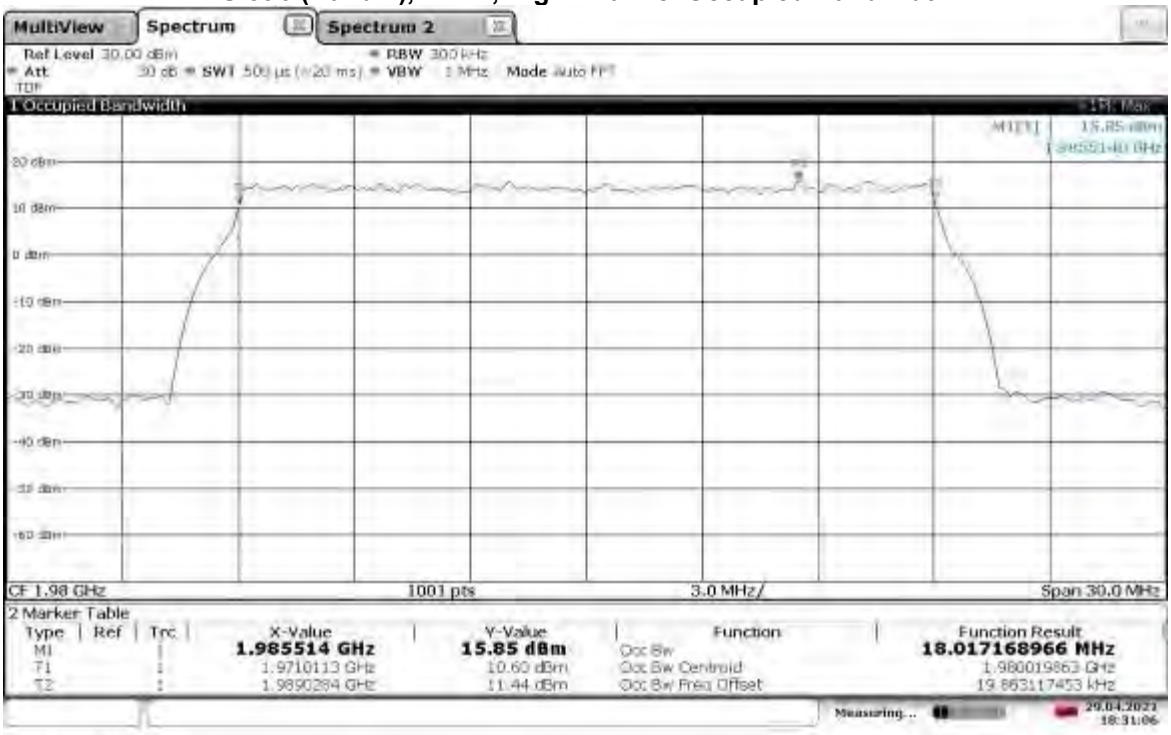
TM3.1a-256QAM_20 MHz Bandwidth

Slot 0 (Band 2), ANT0, High Channel Occupied Bandwidth

18:26:34 29.04.2021

TM3.1a-256QAM_20 MHz Bandwidth

Slot 0 (Band 2), ANT1, High Channel Occupied Bandwidth



18:31:06 29.04.2021

Test Personnel:	Vathana Ven VSV	Test Date:	04/26/2021 04/29/2021
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	FCC Part 24	Limit Applied:	See report section 7.3
Input Voltage:	48 VDC (POE)		
Pretest Verification w/ Ambient Signals or BB Source:	N/A	Ambient Temperature:	22, 23ºC
		Relative Humidity:	21, 15%
		Atmospheric Pressure:	1004, 1013mbars

Deviations, Additions, or Exclusions: None

8 Frequency Stability Over Voltages

8.1 Method

Tests are performed in accordance with ANSI C63.26 and CFR47 FCC Parts 2.1055 and 24.

TEST SITE: AMAP Lab

8.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
CEN001'	DC-40GHz attenuator 20dB	Centric RF	C411-20	CEN001	02/22/2021	01/22/2022
CBLHF2012-2M-2	2m 9kHz-40GHz Coaxial Cable - SET1	Huber & Suhner	SF102	252676002	02/19/2021	02/19/2022
ROS005-1'	Signal and Spectrum Analyzer	Rohde & Schwarz	FSW43	100646	10/27/2020	10/27/2021
DAV005	Weather Station Vantage Vue	Davis	6250	MS191218083	02/07/2021	02/07/2022

Software Utilized:

Name	Manufacturer	Version
None	--	--

8.3 Results:

The sample tested was found to Comply.

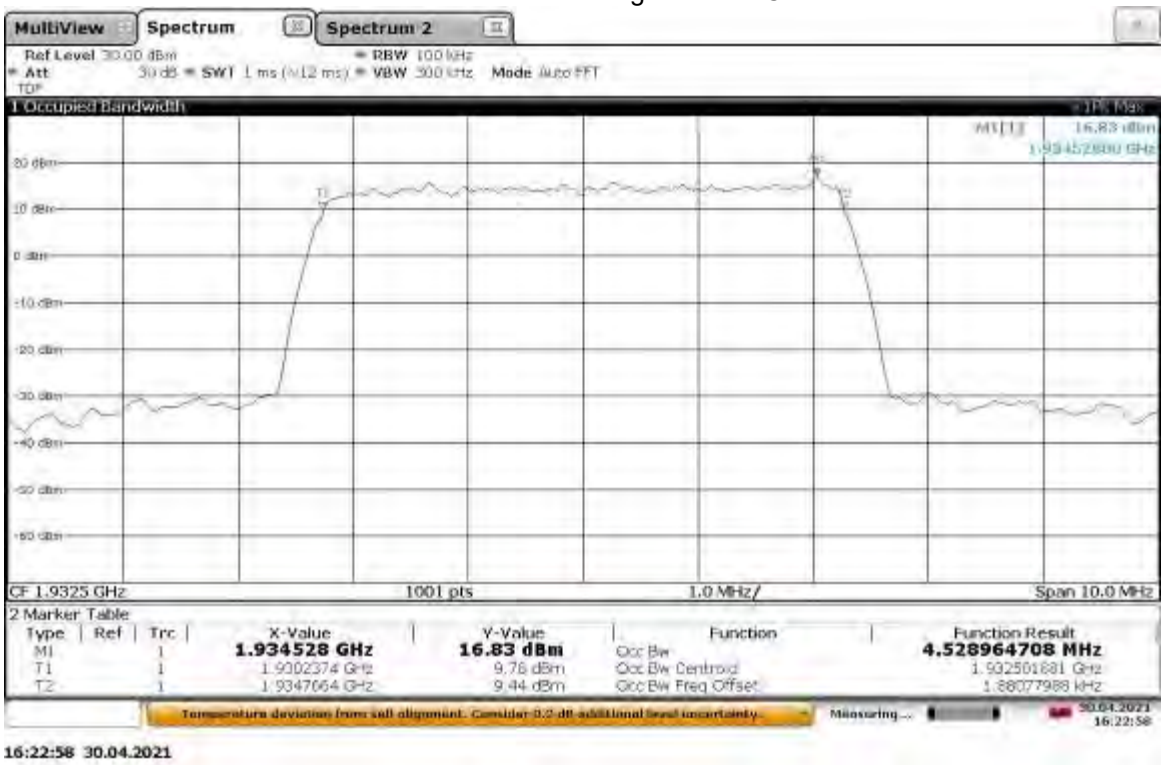
§24.235 Frequency stability – The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. The occupied bandwidth measurement was used to make sure the lower and upper frequencies of the occupied bandwidth remains within the assigned band of 1930-1990 MHz MHz.

8.4 Setup Photographs:

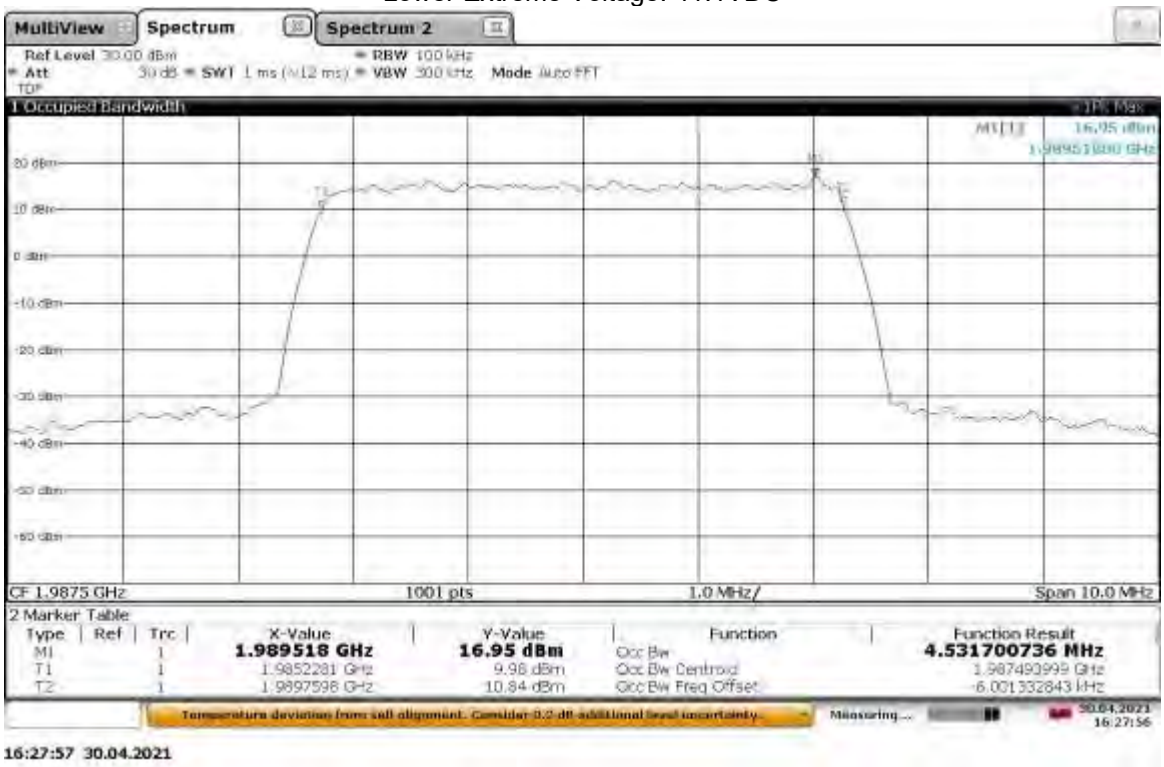
Confidential

8.5 Plots/Data:

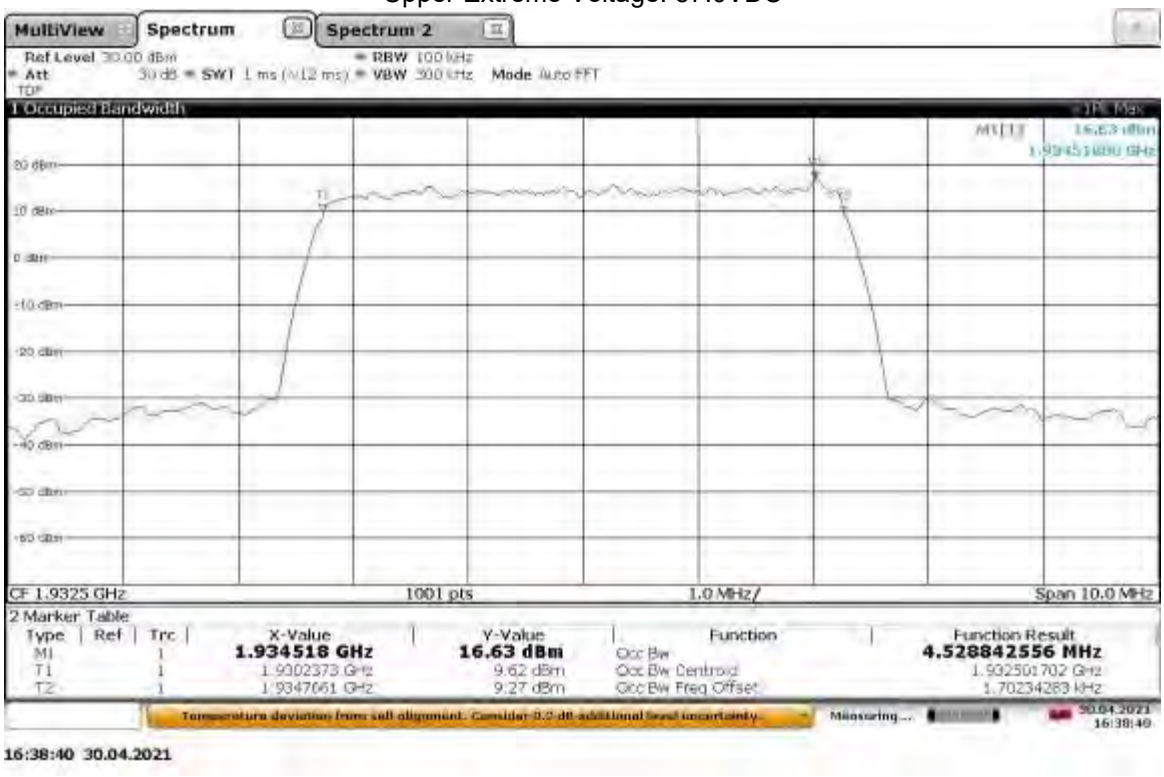
Slot 0 (Band 2), ANT0, Modulation: QPSK, Bandwidth: 5 MHz, Low Channel,
Lower Extreme Voltage: 41.1VDC



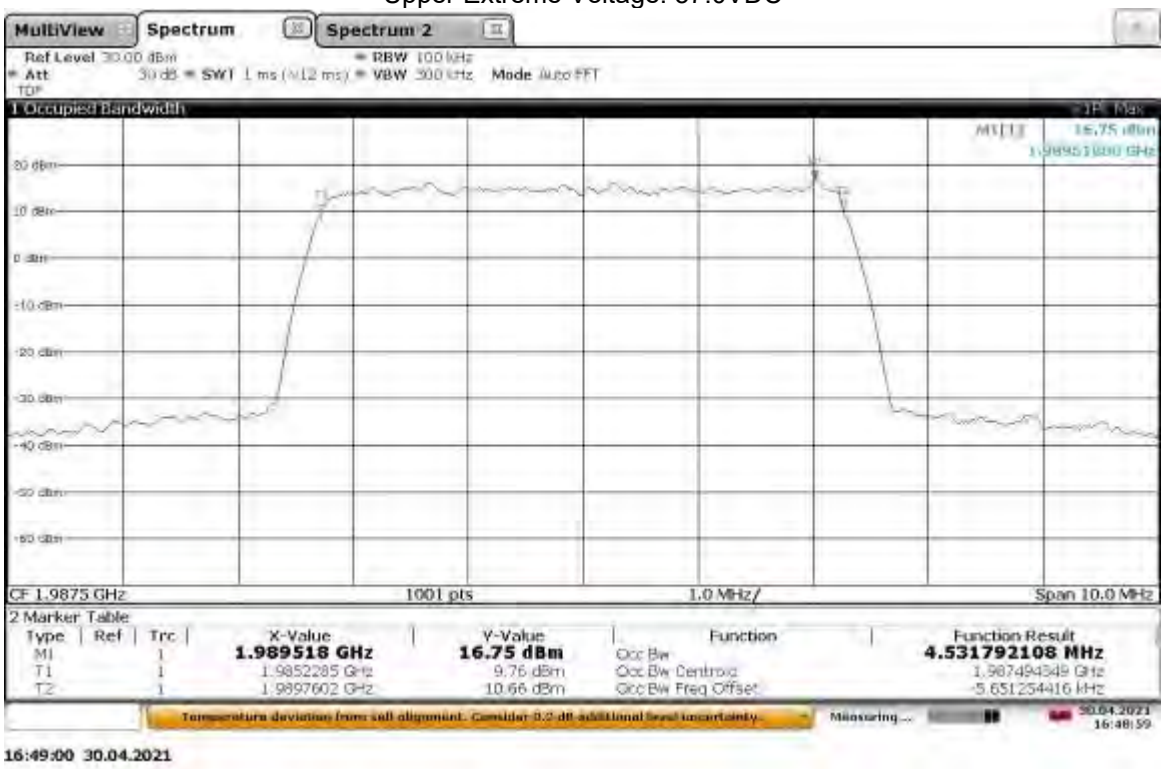
Slot 0 (Band 2), ANT0, Modulation: QPSK, Bandwidth: 5 MHz, High Channel,
Lower Extreme Voltage: 41.1VDC



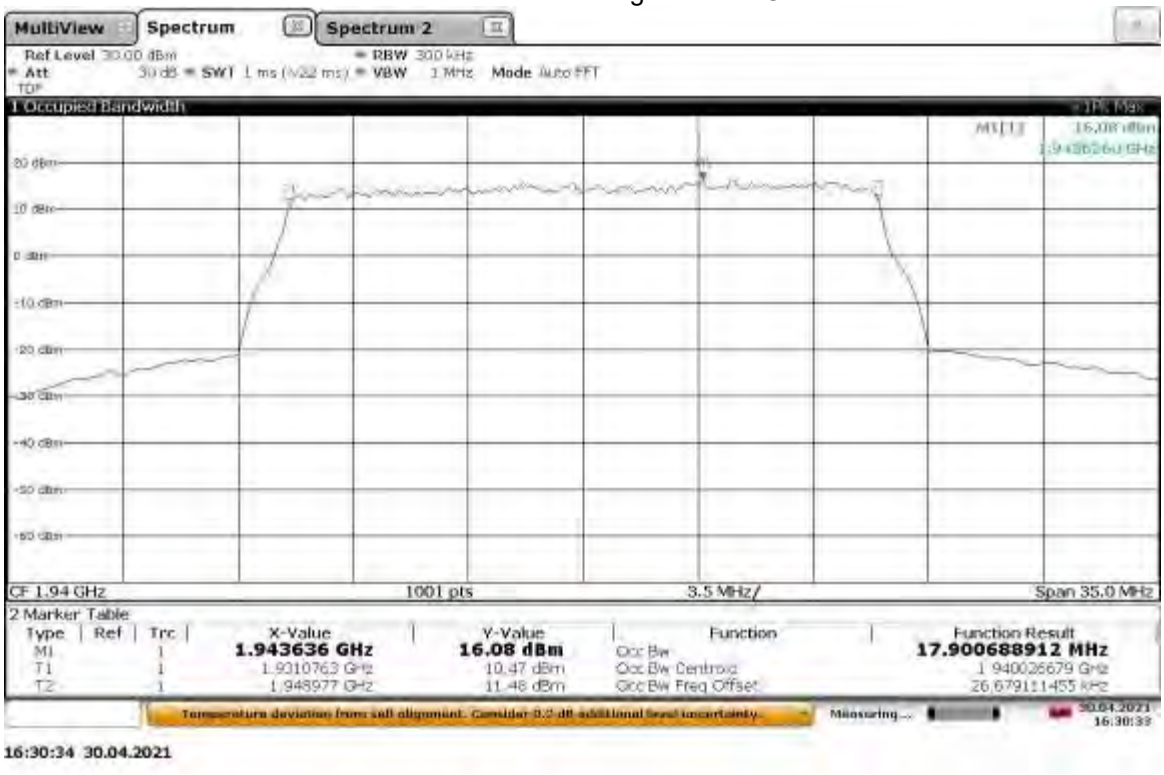
Slot 0 (Band 2), ANT0, Modulation: QPSK, Bandwidth: 5 MHz, Low Channel,
Upper Extreme Voltage: 57.0VDC



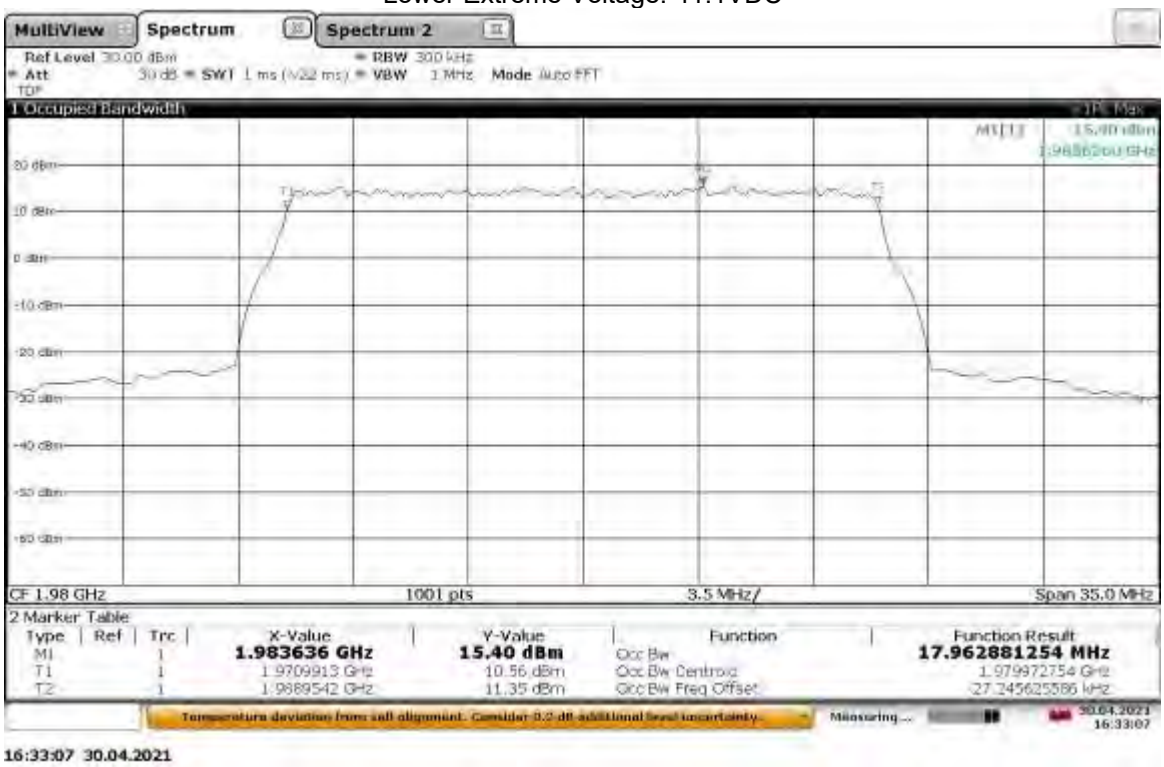
Slot 0 (Band 2), ANT1, Modulation: QPSK, Bandwidth: 5 MHz, High Channel,
Upper Extreme Voltage: 57.0VDC



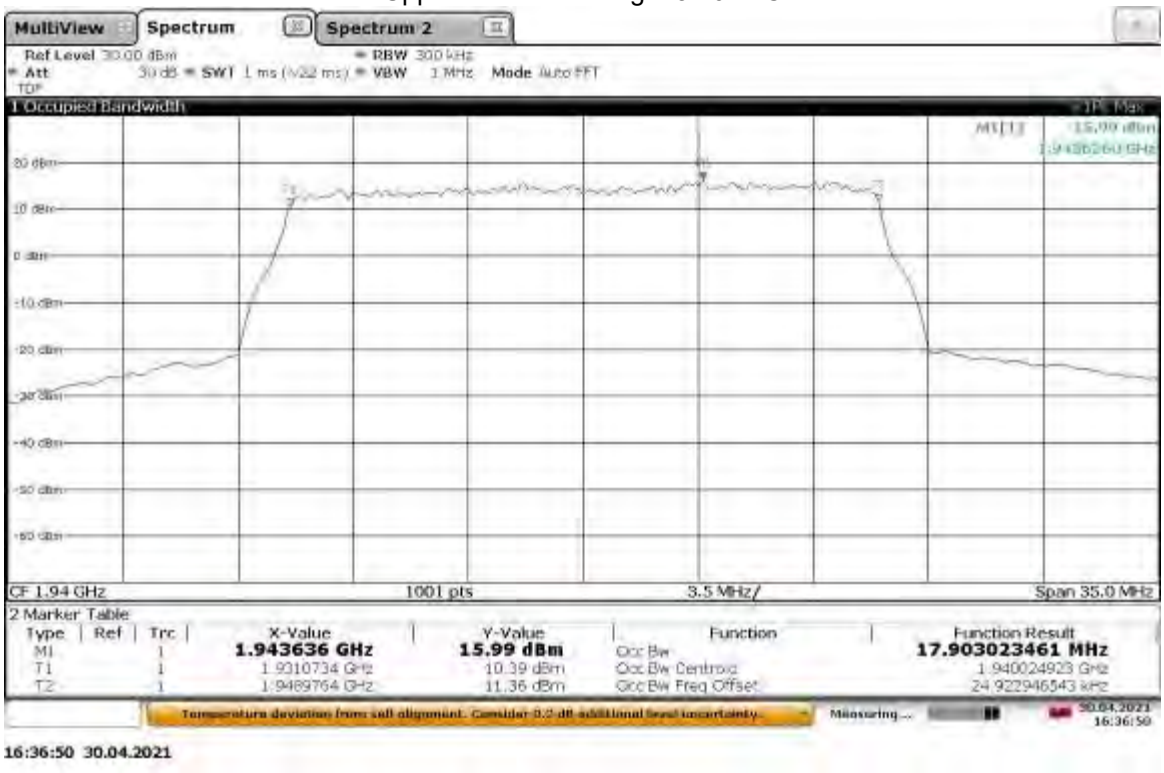
Slot 0 (Band 2), ANT0, Modulation: QPSK, Bandwidth: 20 MHz, Low Channel,
Lower Extreme Voltage: 41.1VDC



Slot 0 (Band 2), ANT0, Modulation: QPSK, Bandwidth: 5 MHz, High Channel,
Lower Extreme Voltage: 41.1VDC

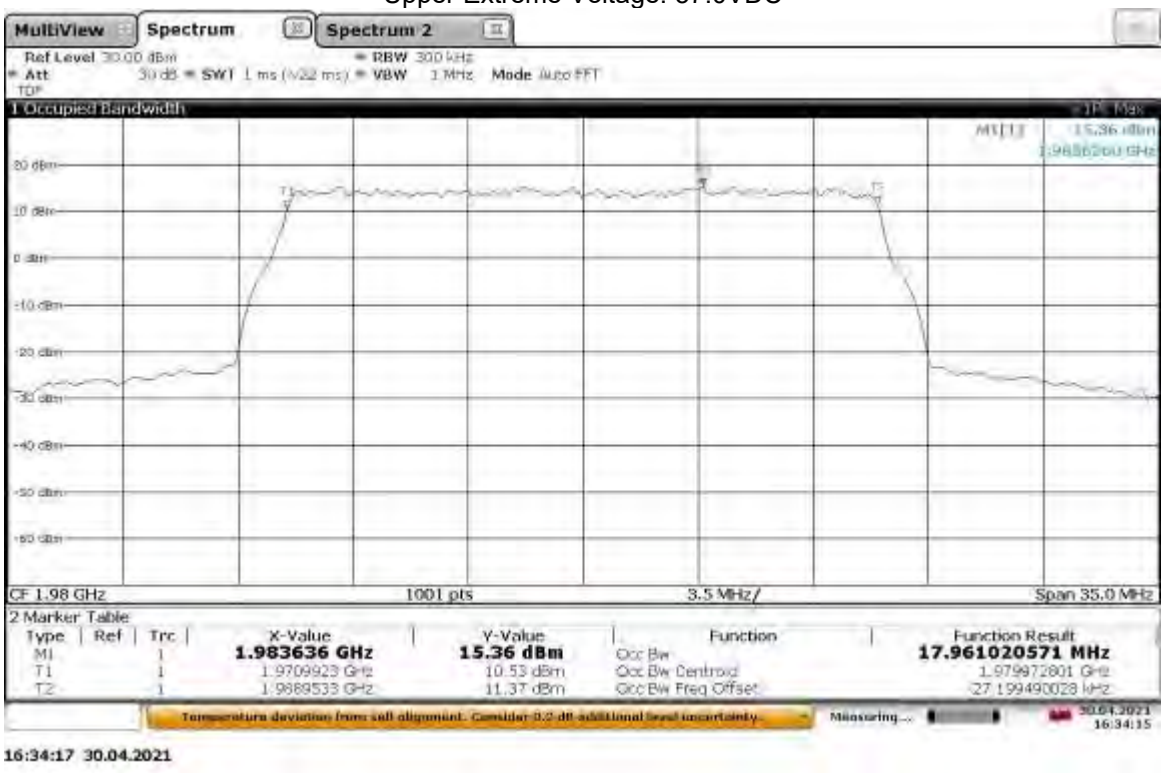


Slot 0 (Band 2), ANT0, Modulation: QPSK, Bandwidth: 20 MHz, Low Channel,
Upper Extreme Voltage: 57.0VDC



16:36:50 30.04.2021

Slot 0 (Band 2), ANT0, Modulation: QPSK, Bandwidth: 5 MHz, High Channel,
Upper Extreme Voltage: 57.0VDC



16:34:17 30.04.2021

Test Personnel:	Vathana Ven VSV	Test Date:	04/30/2021
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	FCC Part 24	Limit Applied:	See report section 8.3
Input Voltage:	48VDC (POE)		
Pretest Verification w/ Ambient Signals or BB Source:	N/A	Ambient Temperature:	22 ºC
		Relative Humidity:	41 %
		Atmospheric Pressure:	1011 mbars

Deviations, Additions, or Exclusions: None

9 Transmitter spurious emissions

9.1 Method

Tests are performed in accordance with ANSI C63.26 and CFR47 FCC Parts 2.1051, 2.1053, 2.1057, and 24

TEST SITE: EMC Lab & 10m ALSE

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 400, and 480 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A Styrofoam table 80 cm high is used for table-top equipment.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucispr
Radiated Emissions, 10m	30-1000 MHz	4.6dB	6.3 dB
Radiated Emissions, 3m	30-1000 MHz	5.3 dB	6.3 dB
Radiated Emissions, 3m	1-6 GHz	4.5 dB	5.2 dB
Radiated Emissions, 3m	6-15 GHz	5.2 dB	5.5 dB
Radiated Emissions, 3m	15-18 GHz	5.0 dB	5.5 dB
Radiated Emissions, 3m	18-40 GHz	5.0 dB	5.5 dB

As shown in the table above our radiated emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG
Where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dBμV
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
FS = 32 dBμV/m

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

Example:

FS = RA + AF + CF – AG = 52.0 + 7.4 + 1.6 – 29.0 = 32.0
$UF = 10^{(32\ dB\mu V / 20)}$ = 39.8 μV/m

Alternately, when BAT-EMC Emission Software is used, the “Level” includes all losses and gains and is compared directly in the “Margin” column to the “Limit”. The “Correction” includes Antenna Factor, Preamp, and Cable Loss. These are already accounted for in the “Level” column.

9.2 Test Equipment Used:

Test equipment used for antenna port conducted test

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
CEN001'	DC-40GHz attenuator 20dB	Centric RF	C411-20	CEN001	02/22/2021	01/22/2022
CBLHF2012-2M-2	2m 9kHz-40GHz Coaxial Cable - SET1	Huber & Suhner	SF102	252676002	02/19/2021	02/19/2022
ROS005-1'	Signal and Spectrum Analyzer	Rohde & Schwarz	FSW43	100646	10/27/2020	10/27/2021
DAV005	Weather Station Vantage Vue	Davis	6250	MS191218083	02/07/2021	02/07/2022

Software Utilized:

Name	Manufacturer	Version
None	--	--

Test equipment used for Radiated emissions

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DS42'	Weather Station Vantage Vue	Davis	6250	MS191212003	02/24/2021	02/24/2022
145145'	Broadband Hybrid Antenna 30 MHz - 3 GHz	Sunol Sciences Corp.	JB3	A122313	05/07/2020	05/07/2021
PRE11'	50dB gain pre-amp	Pasternack	PRE11	PRE11	09/21/2020	09/21/2021
145108'	Receiver	Rhode & Schwarz	ESIB40	100209	06/08/2020	06/08/2021
HS002'	Pre-amp to under floor cable	Huber & Suhner	SucoFlex 106A	HS002	11/25/2020	11/25/2021
145-406'	10m Track A In-floor Cable #1	Huber + Suhner	sucoflex 160-19220mm	001	07/13/2020	07/13/2021
IW001'	Receiver to floor cable	Insulated Wire	2801-NPS	001	10/07/2020	10/07/2021
IW006'	Pre-amp to antenna cable	Insulated Wire	2800-NPS	IW006	11/25/2020	11/25/2021
PRE12'	Pre-amp, 1-18GHz	Com-Power	PAM-118A	18040117	12/07/2020	12/07/2021
ETS002'	1-18GHz DRG Horn Antenna	ETS Lindgren	3117	00143260	08/03/2020	08/03/2021
145-414'	3m Track A cables	Huber + Suhner	3m Track A cables	multiple	06/25/2020	06/25/2021
IW002'	2 meter Armored cable	Insulated Wire	2800-NPS	002	09/23/2020	09/23/2021
IW003'	8.4 meter cable	Insulated Wire	2800-NPS	003	10/08/2020	10/08/2021

Software Utilized:

Name	Manufacturer	Version
BAT-EMC	Nexio	3.18.0.16

9.3 Results:

The sample tested was found to Comply. Where a resolution bandwidth of less than 1 MHz was used (in some cases, 120 kHz or 100 kHz), more than 10 dB margin to the limit is shown. Since the two antenna ports transmit uncorrelated data streams and use cross polarized antennas, no adjustments to the test results were applied due to MIMO operation, per KDB 662911.

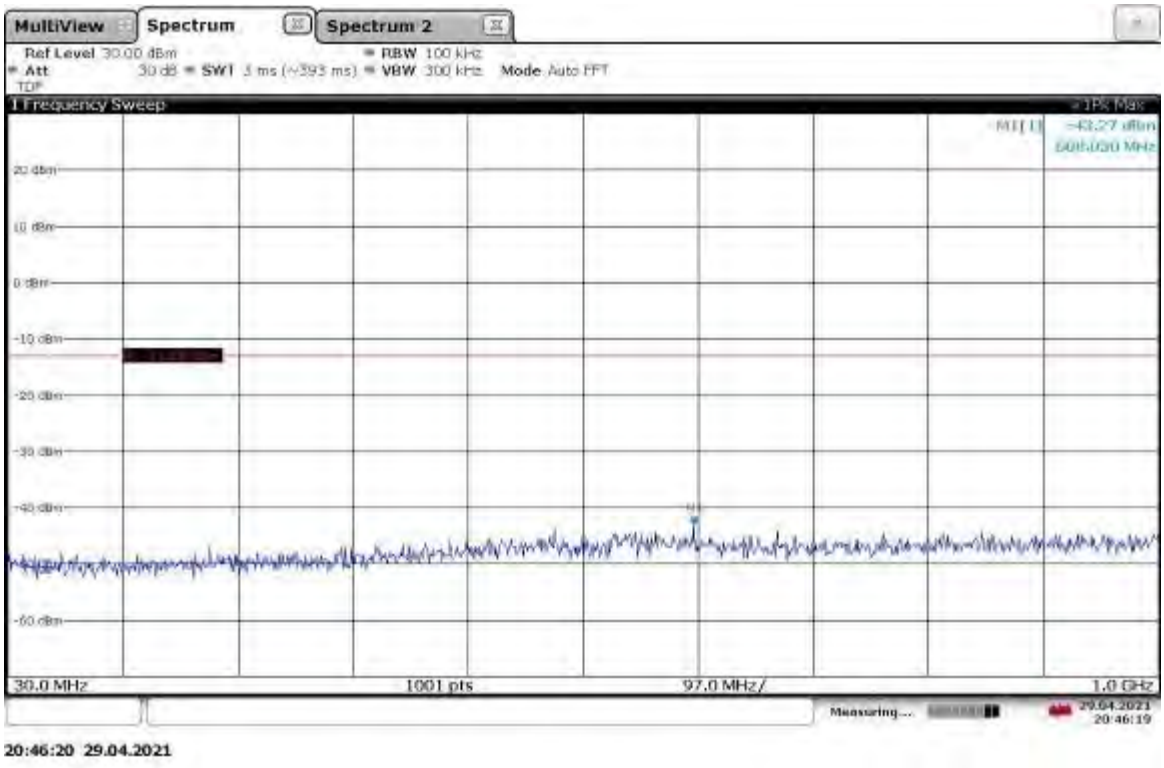
§24.238(a): The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.
(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

9.4 Setup Photographs:

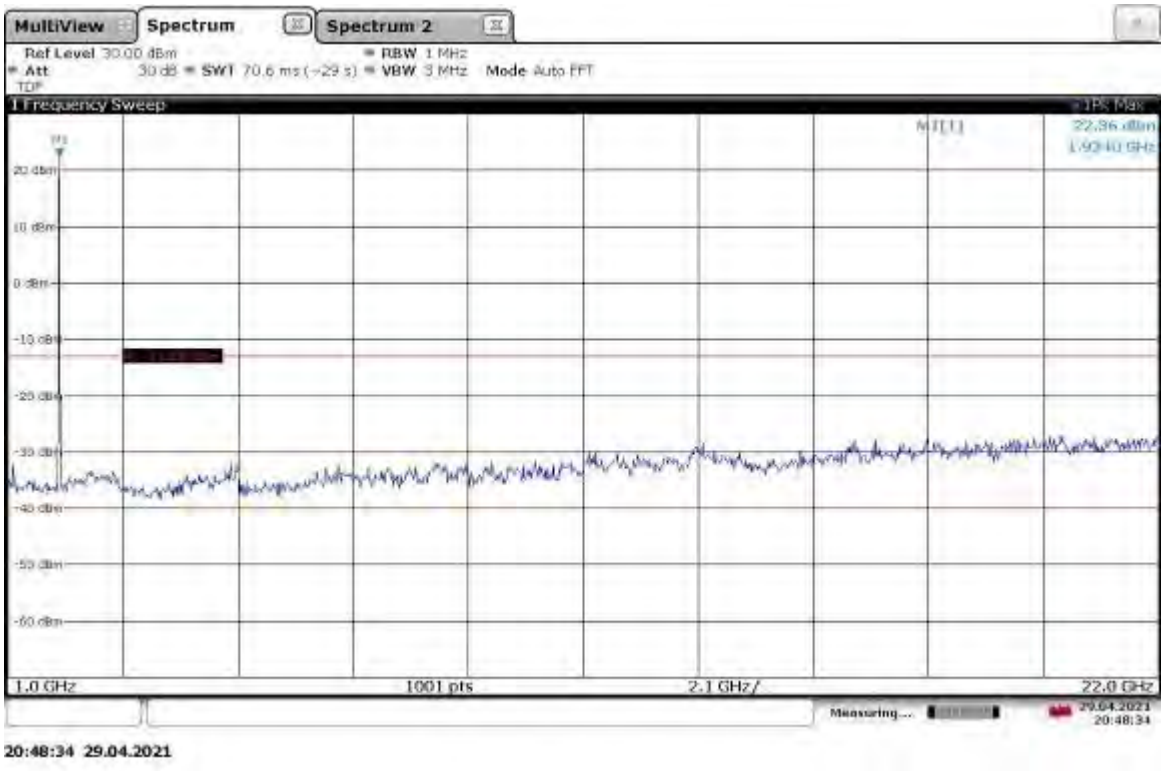
Confidential

9.5 Plots/Data:

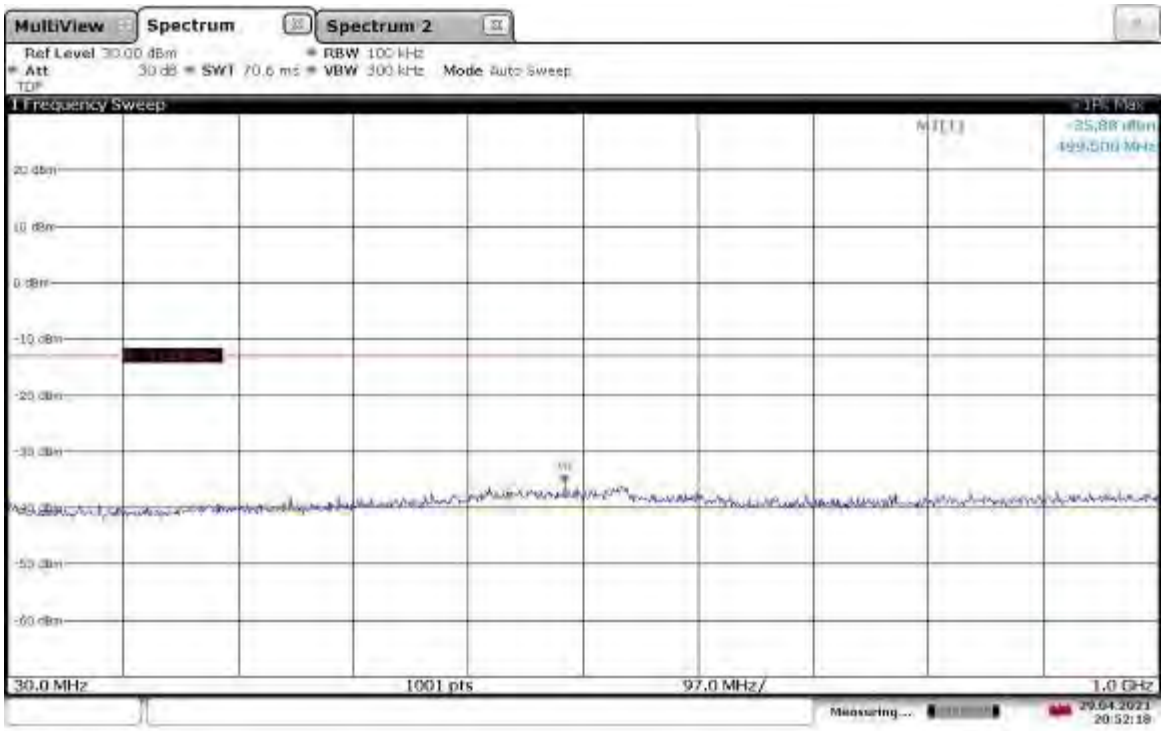
Slot 0 (Band 2), ANT0, Modulation: TM3.1-64QAM, Bandwidth: 5 MHz, Low Channel 1932.5 MHz 30MHz-1GHz



Slot 0 (Band 2), ANT0, Modulation: TM3.1-64QAM, Bandwidth: 5 MHz, Low Channel 1932.5 MHz 1-22 GHz

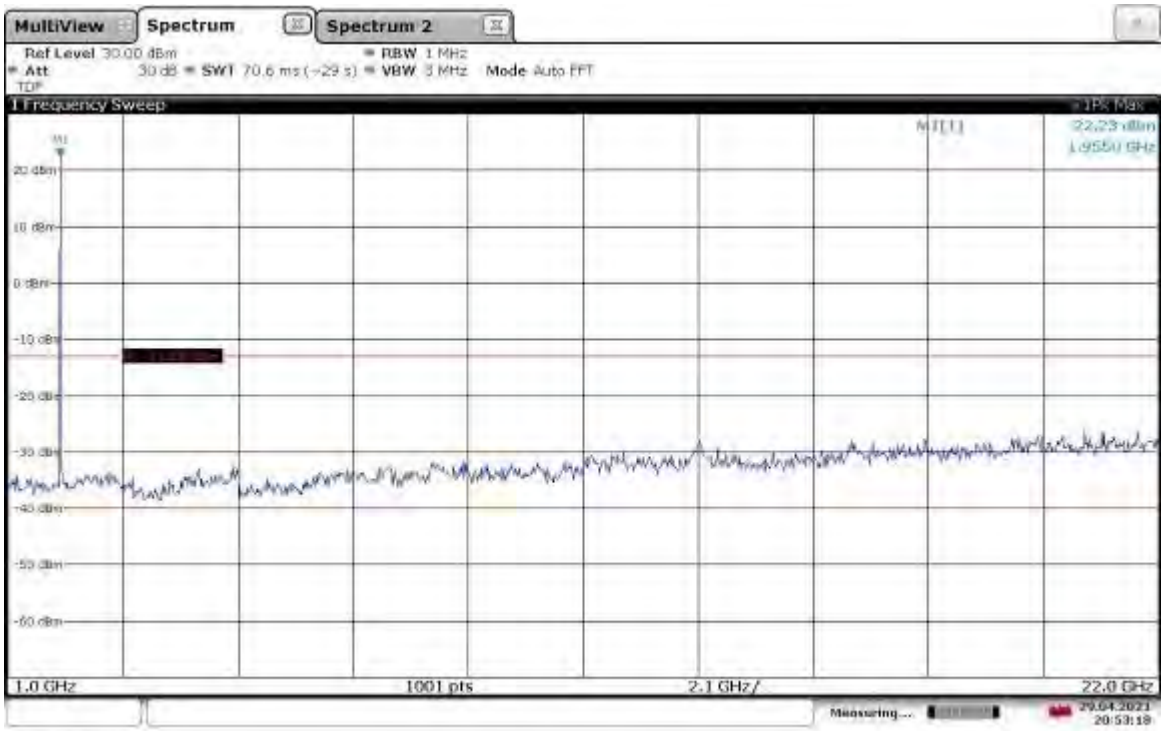


Slot 0 (Band 2), ANT0, Modulation: TM3.1-64QAM, Bandwidth: 5 MHz, Mid Channel 1960 MHz
30MHz-1GHz



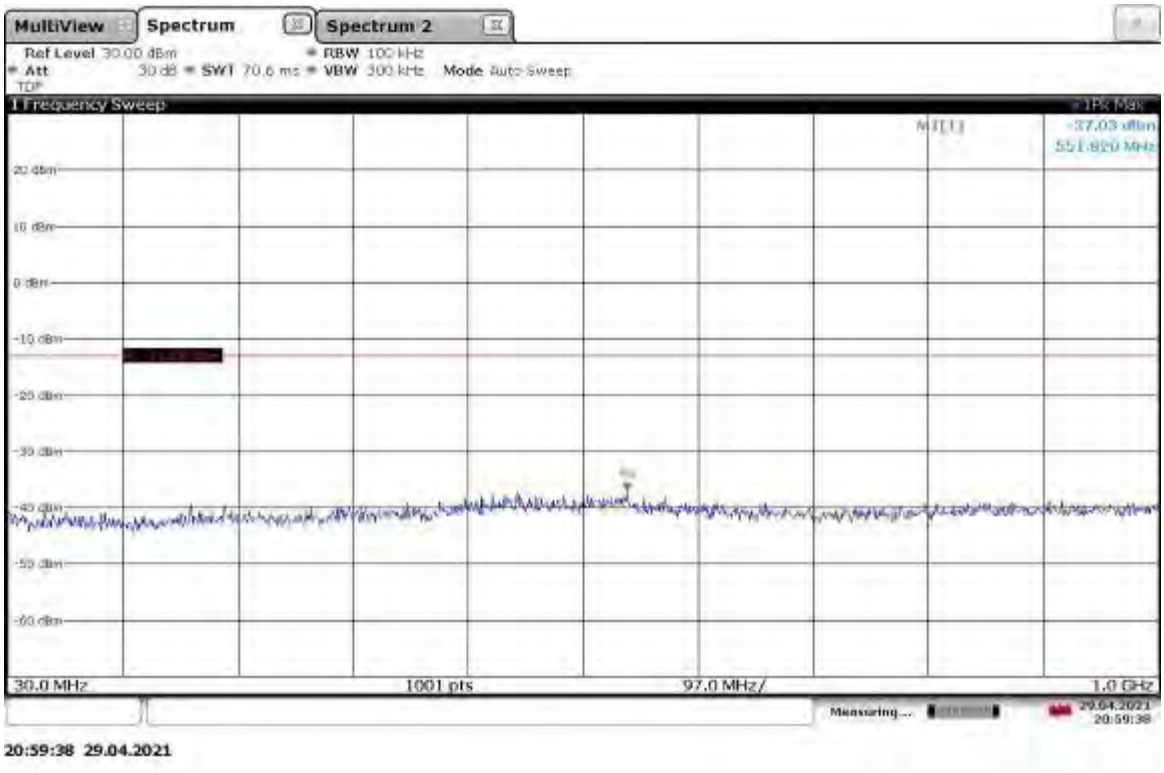
20:52:18 29.04.2021

Slot 0 (Band 2), ANT0, Modulation: TM3.1-64QAM, Bandwidth: 5 MHz, Mid Channel 1960 MHz
1-22GHz

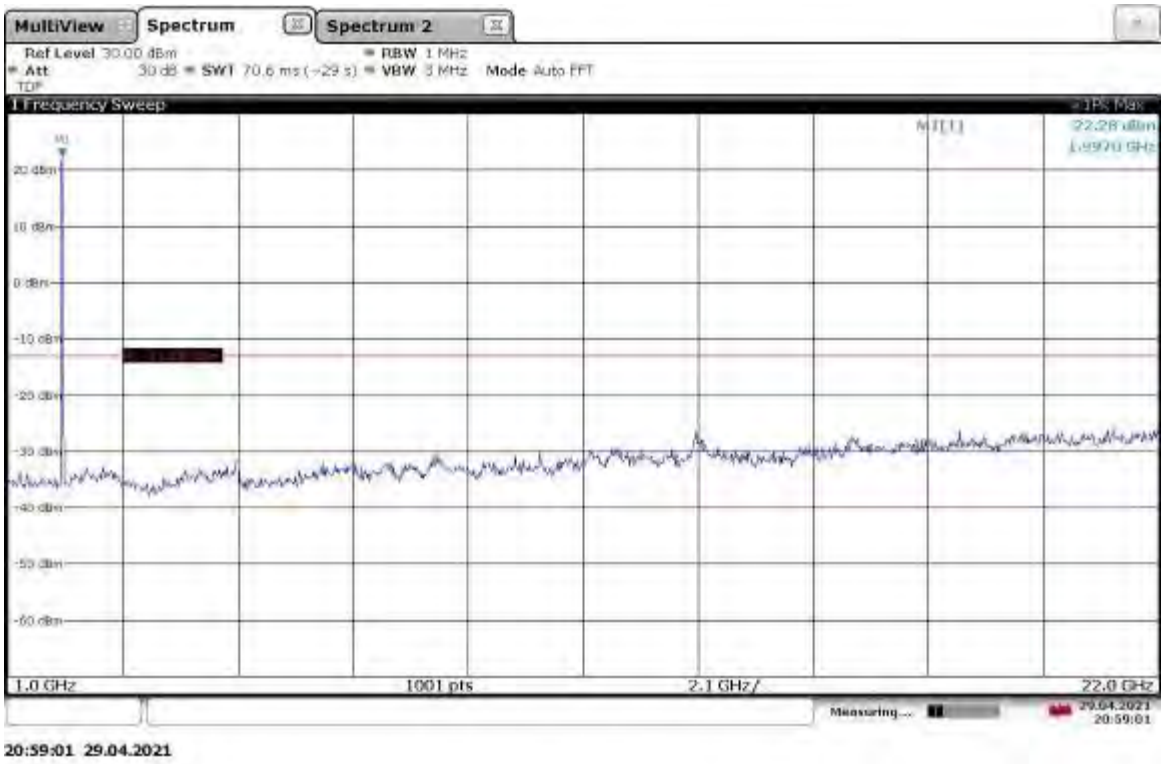


20:53:18 29.04.2021

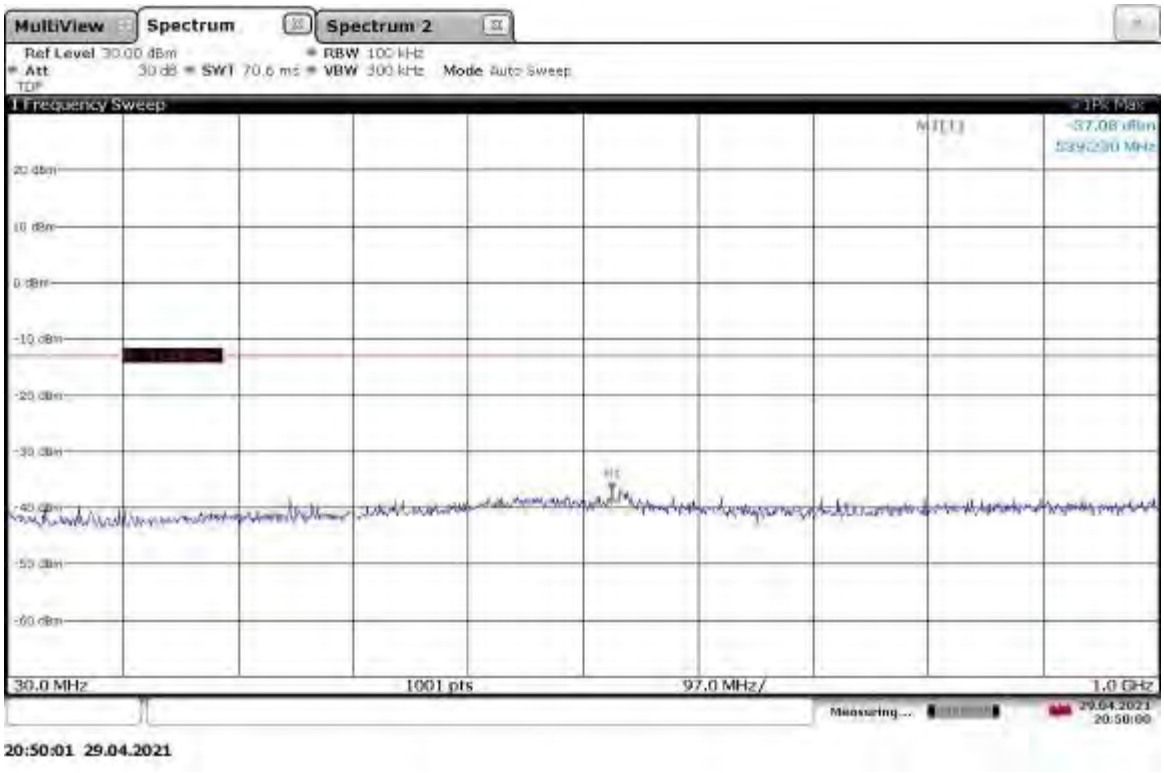
Slot 0 (Band 2), ANT0, Modulation: TM3.1-64QAM, Bandwidth: 5 MHz, High Channel 1987.5 MHz 30MHz-1GHz



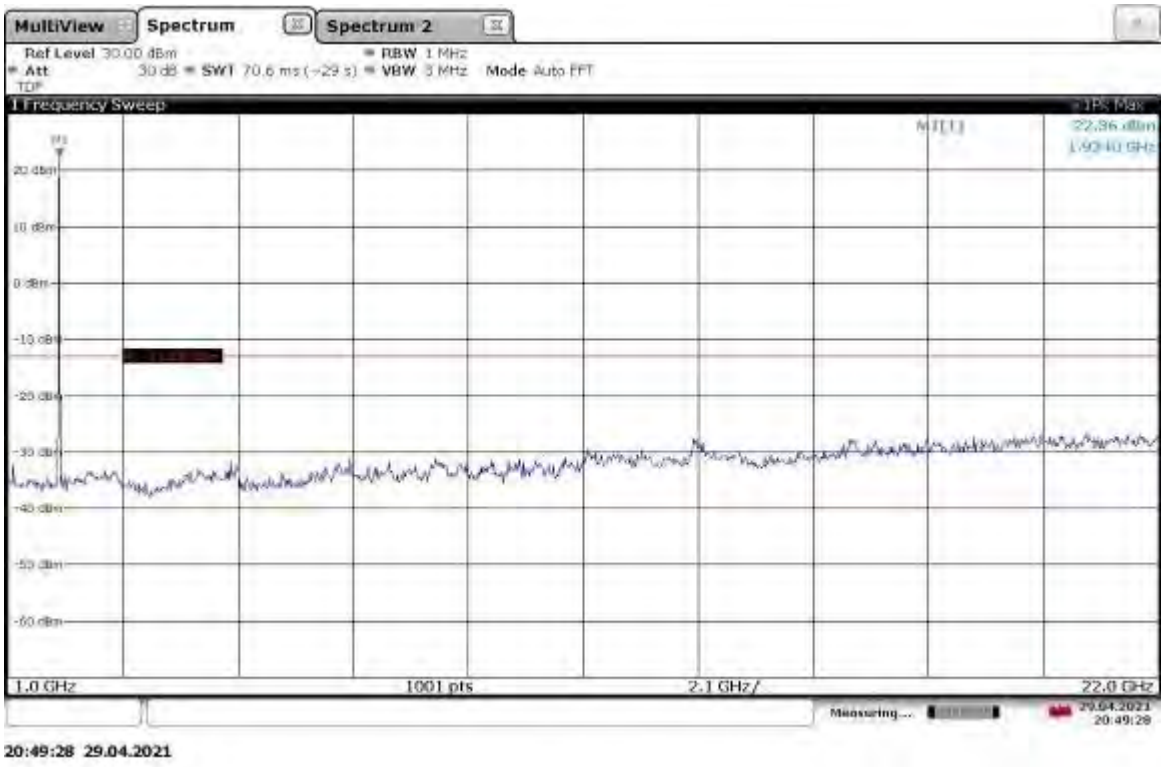
Slot 0 (Band 2), ANT0, Modulation: TM3.1-64QAM, Bandwidth: 5 MHz, High Channel 1987.5 MHz 1-22GHz



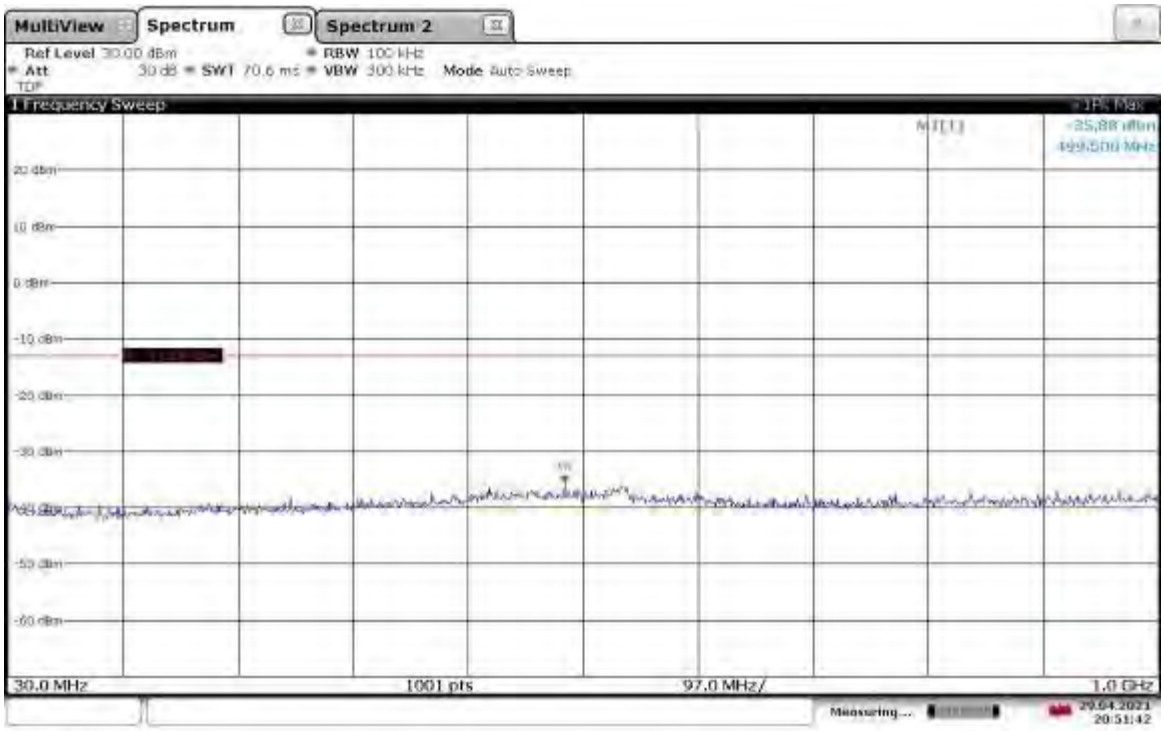
Slot 0 (Band 2), ANT1, Modulation: TM3.1-64QAM, Bandwidth: 5 MHz, Low Channel 1932.5 MHz
30MHz-1GHz



Slot 0 (Band 2), ANT1, Modulation: TM3.1-64QAM, Bandwidth: 5 MHz, Low Channel 1932.5 MHz
1-22GHz

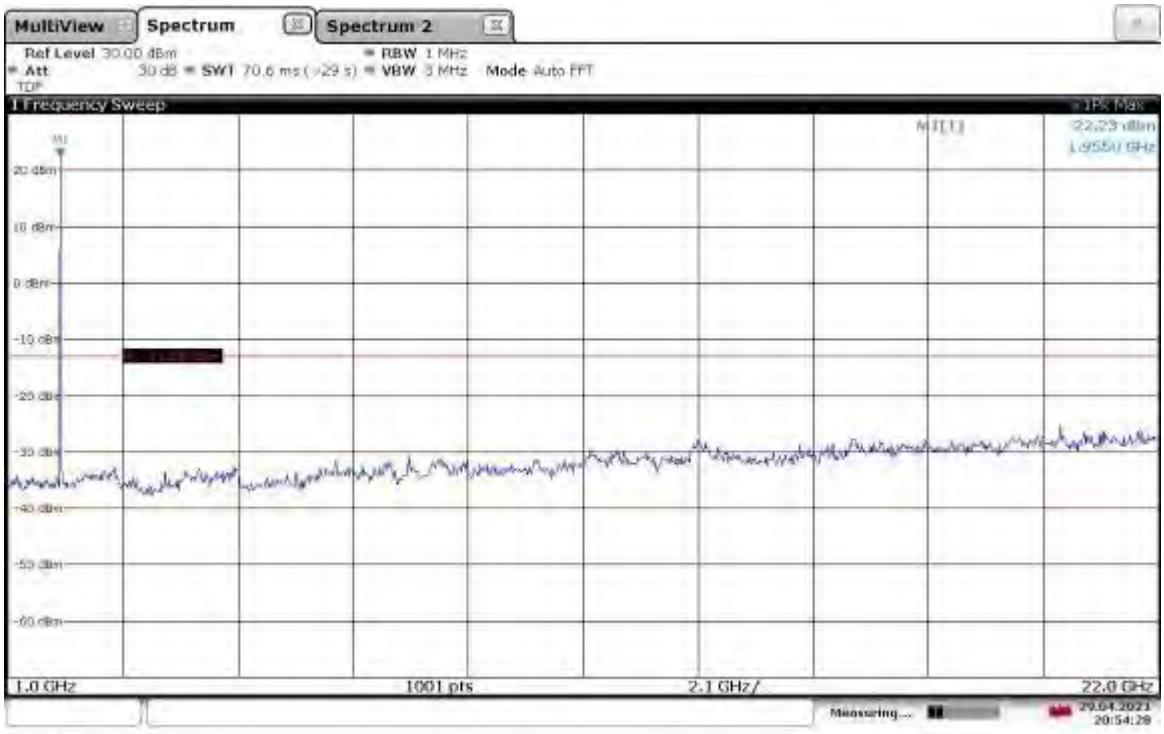


Slot 0 (Band 2), ANT1, Modulation: TM3.1-64QAM, Bandwidth: 5 MHz, Mid Channel 1960 MHz
30MHz-1GHz



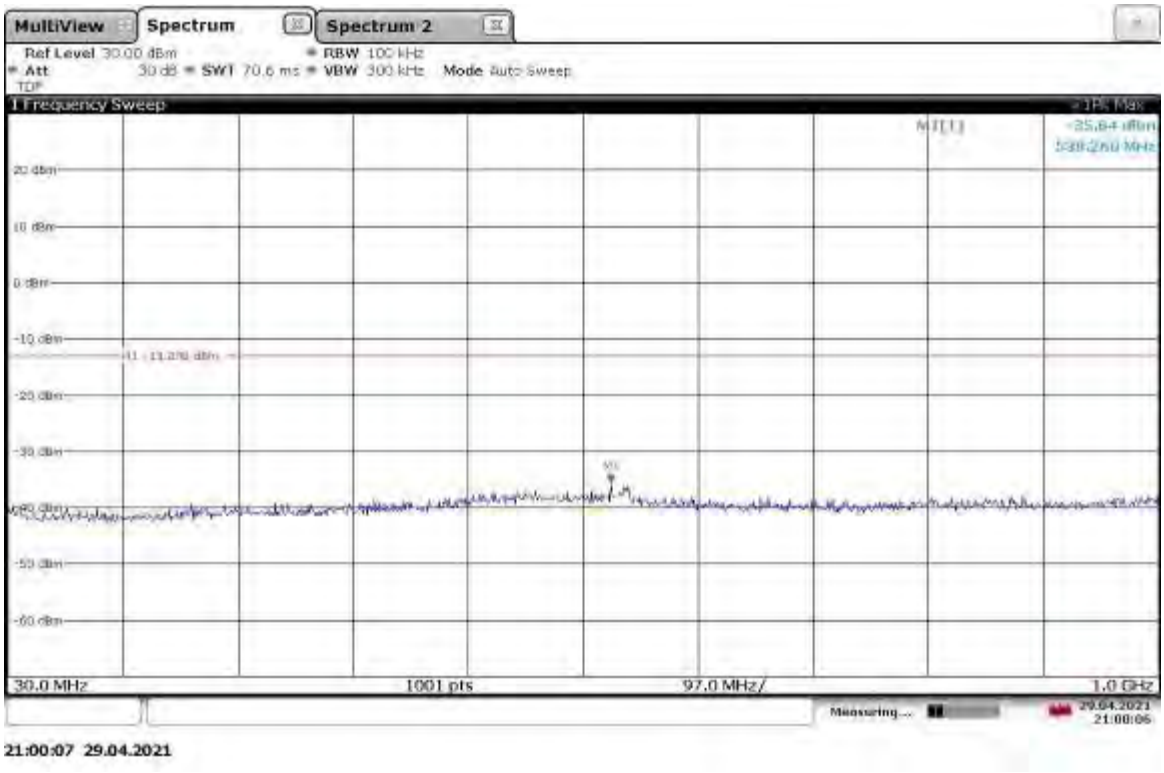
20:51:43 29.04.2021

Slot 0 (Band 2), ANT1, Modulation: TM3.1-64QAM, Bandwidth: 5 MHz, Mid Channel 1960 MHz
1-22GHz

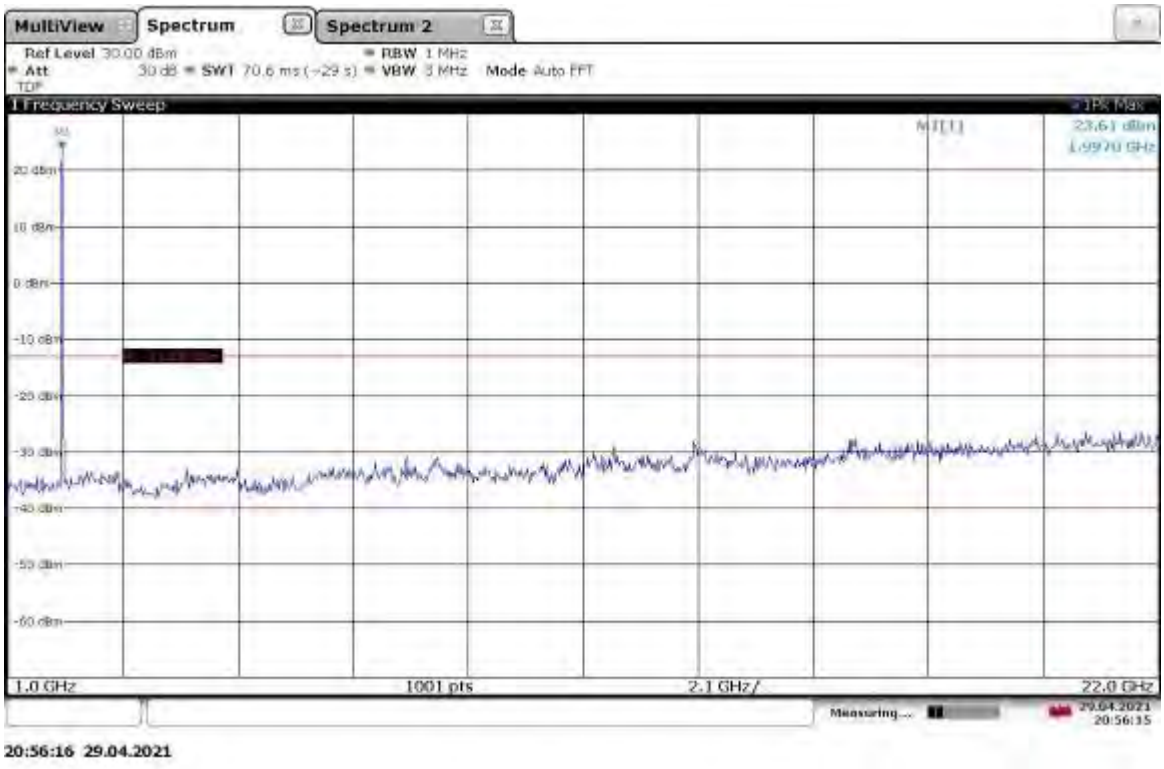


20:54:28 29.04.2021

Slot 0 (Band 2), ANT1, Modulation: TM3.1-64QAM, Bandwidth: 5 MHz, High Channel 1987.5 MHz
30MHz-1GHz



Slot 0 (Band 2), ANT1, Modulation: TM3.1-64QAM, Bandwidth: 5 MHz, High Channel 1987.5 MHz
1-22GHz

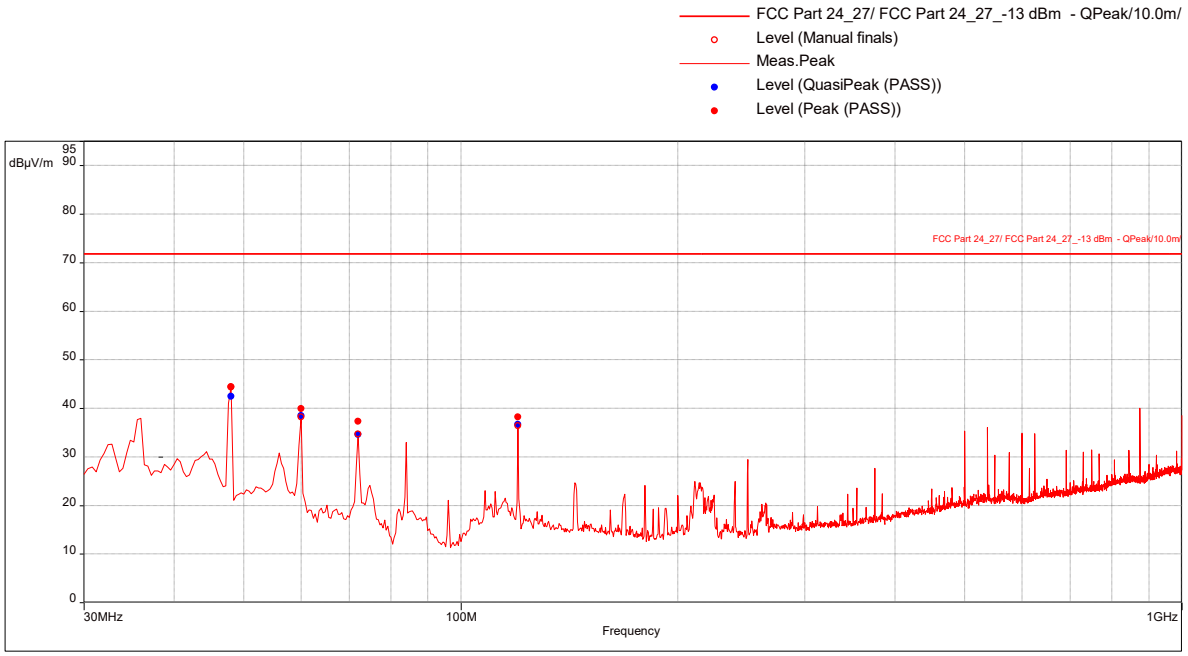


Radiated Emissions, 30-1000 MHz
Slot 0 (Band 2), Modulation: TM3.1-64QAM, Bandwidth 5 MHz, Transmit @ Low Channel

Test Information:

Date and Time	4/30/2021 5:53:22 PM
Client and Project Number	Commscope_G104601893
Engineer	Vathana Ven
Temperature	24 deg C
Humidity	32%
Atmospheric Pressure	984 mbar
Comments	RE 30-1000MHz_POE_Band 2_5MHz BW_TM3.1(worst-case)_Tx Low CH 1932.5MHz

Graph:



Results:

Peak (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Level EIRP (dBm)	Limit (dBm)	Margin (dB)	Azimuth (°) (dB)	Height (m) (dB)	Pol. (dB)	RBW (dB)	Correction (dB)
48	44.39	-40.01	-13.00	-27.01	291.00	1.00	Vertical	120000.00	-24.72
60	39.96	-44.44	-13.00	-31.44	25.00	1.67	Vertical	120000.00	-25.86
72	37.28	-47.13	-13.00	-34.13	55.00	2.18	Vertical	120000.00	-25.22
120	38.17	-46.23	-13.00	-33.23	4.00	1.81	Vertical	120000.00	-18.93

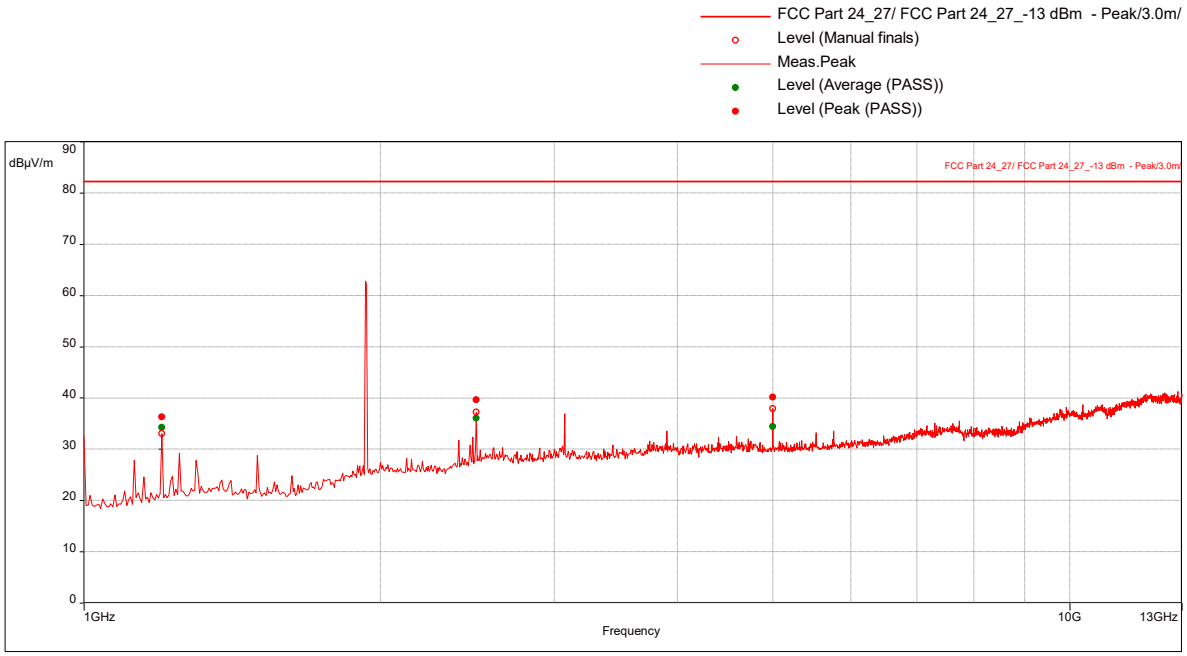
Level EIRP (dBm) = Level Peak (dBuV/m) - 84.4

Radiated Emissions, 1-22 GHz
Slot 0 (Band 2), Modulation: TM3.1-64QAM, Bandwidth 5 MHz, Transmit @ Low Channel

Test Information:

Date and Time	4/30/2021 9:26:32 PM
Client and Project Number	Commscope_G104601893
Engineer	Vathana Ven
Temperature	24 deg C
Humidity	32%
Atmospheric Pressure	984 mbar
Comments	RE 1 to 13 GHz_POE_Band 2_5MHz BW_TM3.1(worst-case)_Tx Low CH 1932.5MHz

Graph:



Results:

Peak (PASS) (3)

Frequency (MHz)	Level (dBµV/m)	Level EIRP (dBm)	Limit (dBm)	Margin (dB)	Azimuth (°) (dB)	Height (m) (dB)	Pol. (dB)	RBW (dB)	Correction (dB)
1200	36.30	-48.10	-13.00	-35.10	4.00	3.40	Vertical	1000000.00	-21.36
2500	39.59	-44.81	-13.00	-31.81	231.00	1.05	Horizontal	1000000.00	-14.74
5000	40.16	-44.24	-13.00	-31.24	107.00	1.15	Vertical	1000000.00	-10.24

Level EIRP (dBm) = Level Peak (dBuV/m) - 84.4

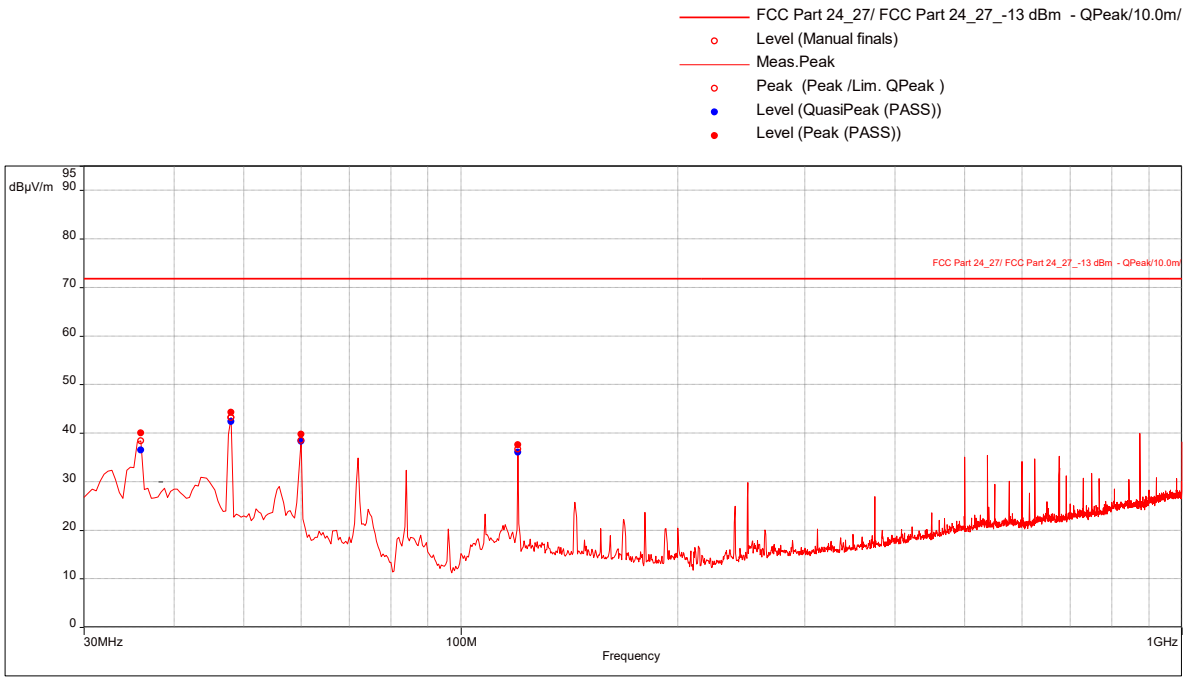
Big peak was a fundamental frequency – scan from 13-22 GHz was performed manually at a close distance. No emissions were detected above the measuring equipment noise floor.

Radiated Emissions, 30-1000 MHz
Slot 0 (Band 2), Modulation: TM3.1-64QAM, Bandwidth 5 MHz, Transmit @ Mid Channel

Test Information:

Date and Time	4/30/2021 6:45:35 PM
Client and Project Number	Commscope_G104601893
Engineer	Vathana Ven
Temperature	24 deg C
Humidity	32%
Atmospheric Pressure	984 mbar
Comments	RE 30-1000MHz_POE_Band 2_5MHz BW_TM3.1(worst-case)_Tx Mid CH 1960MHz

Graph:



Results:

Peak (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Level EIRP (dBm)	Limit (dBm)	Margin (dB)	Azimuth (°) (dB)	Height (m) (dB)	Pol. (dB)	RBW (dB)	Correction (dB)
35.96842105	39.97	-44.43	-13.00	-31.43	11.00	1.00	Vertical	120000.00	-16.53
48	44.24	-40.16	-13.00	-27.16	290.00	1.00	Vertical	120000.00	-24.72
60	39.74	-44.66	-13.00	-31.66	25.00	1.96	Vertical	120000.00	-25.86
120	37.58	-46.82	-13.00	-33.82	1.00	1.37	Vertical	120000.00	-18.93

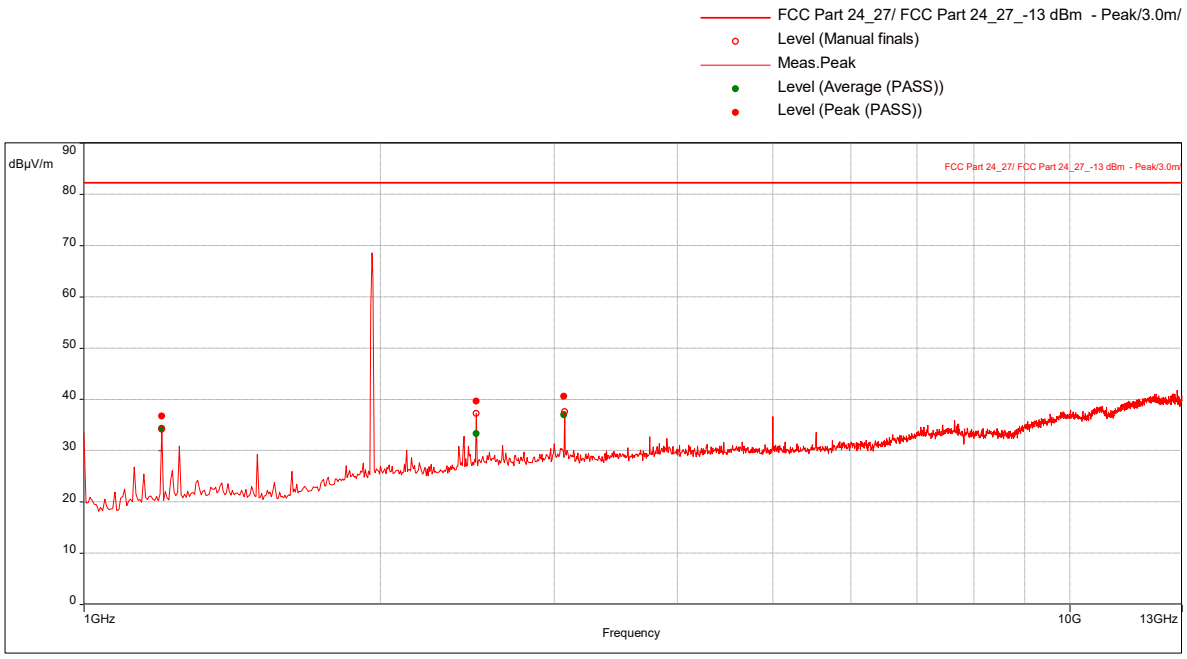
Level EIRP (dBm) = Level Peak (dBuV/m) - 84.4

Radiated Emissions, 1-22 GHz
Slot 0 (Band 2), Modulation: TM3.1-64QAM, Bandwidth 5 MHz, Transmit @ Mid Channel

Test Information:

Date and Time	4/30/2021 9:45:12 PM
Client and Project Number	Commscope_G104601893
Engineer	Vathana Ven
Temperature	24 deg C
Humidity	32%
Atmospheric Pressure	984 mbar
Comments	RE 1 to 13 GHz_POE_Band 2_5MHz BW_TM3.1(worst-case)_Tx Mid CH 1960MHz

Graph:



Results:

Peak (PASS) (3)

Frequency (MHz)	Level (dBµV/m)	Level EIRP (dBm)	Limit (dBm)	Margin (dB)	Azimuth (°) (dB)	Height (m) (dB)	Pol. (dB)	RBW (dB)	Correction (dB)
1200	36.72	-47.68	-13.00	-34.68	12.00	2.10	Vertical	1000000.00	-21.36
2500	39.59	-44.81	-13.00	-31.81	69.00	1.30	Horizontal	1000000.00	-14.74
3071.842105	40.53	-43.87	-13.00	-30.87	4.00	1.30	Vertical	1000000.00	-12.82

Level EIRP (dBm) = Level Peak (dBuV/m) - 84.4

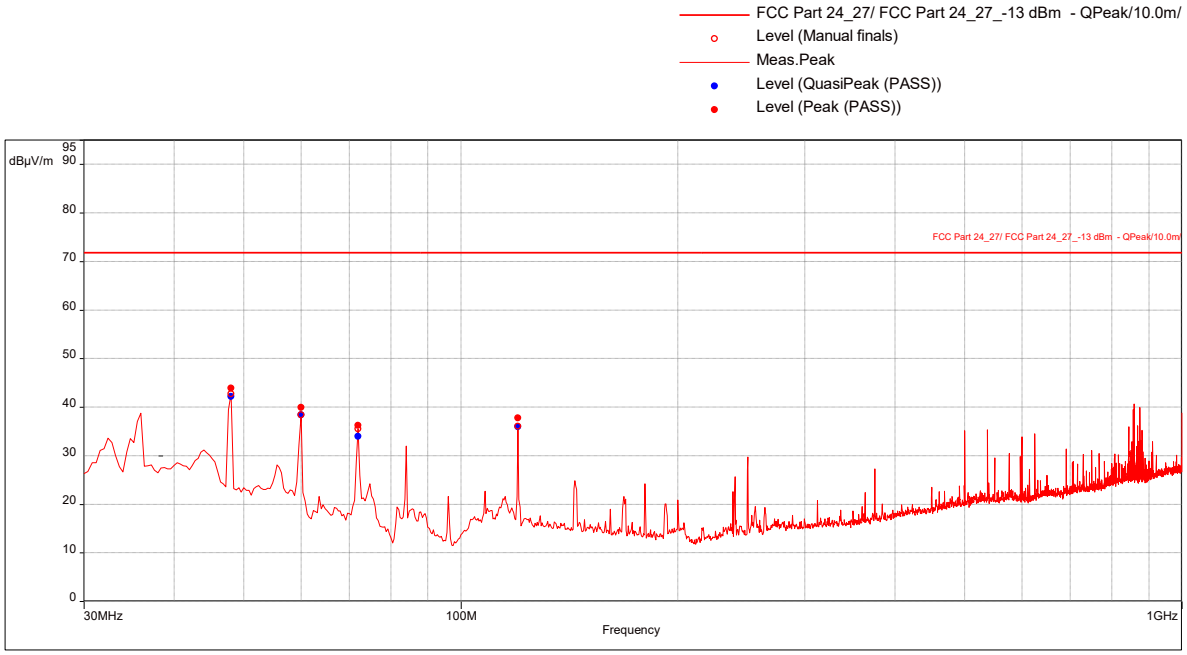
Big peak was a fundamental frequency – scan from 13-22 GHz was performed manually at a close distance. No emissions were detected above the measuring equipment noise floor.

Radiated Emissions, 30-1000 MHz
Slot 0 (Band 2), Modulation: TM3.1-64QAM, Bandwidth 5 MHz, Transmit @ High Channel

Test Information:

Date and Time	4/30/2021 7:28:49 PM
Client and Project Number	Commscope_G104601893
Engineer	Vathana Ven
Temperature	24 deg C
Humidity	32%
Atmospheric Pressure	984 mbar
Comments	RE 30-1000MHz_POE_Band 2_5MHz BW_TM3.1(worst-case)_Tx High CH 1987.5MHz

Graph:



Results:

Peak (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Level EIRP (dBm)	Limit (dBµV/m)	Margin (dB)	Azimuth (°) (dB)	Height (m) (dB)	Pol. (dB)	RBW (dB)	Correction (dB)
48	43.91	-40.49	-13.00	-27.49	290.00	1.00	Vertical	120000.00	-24.72
60	39.88	-44.52	-13.00	-31.52	54.00	2.20	Vertical	120000.00	-25.86
72	36.24	-48.16	-13.00	-35.16	25.00	1.05	Horizontal	120000.00	-25.22
120	37.72	-46.68	-13.00	-34.68	0.00	1.88	Vertical	120000.00	-18.93

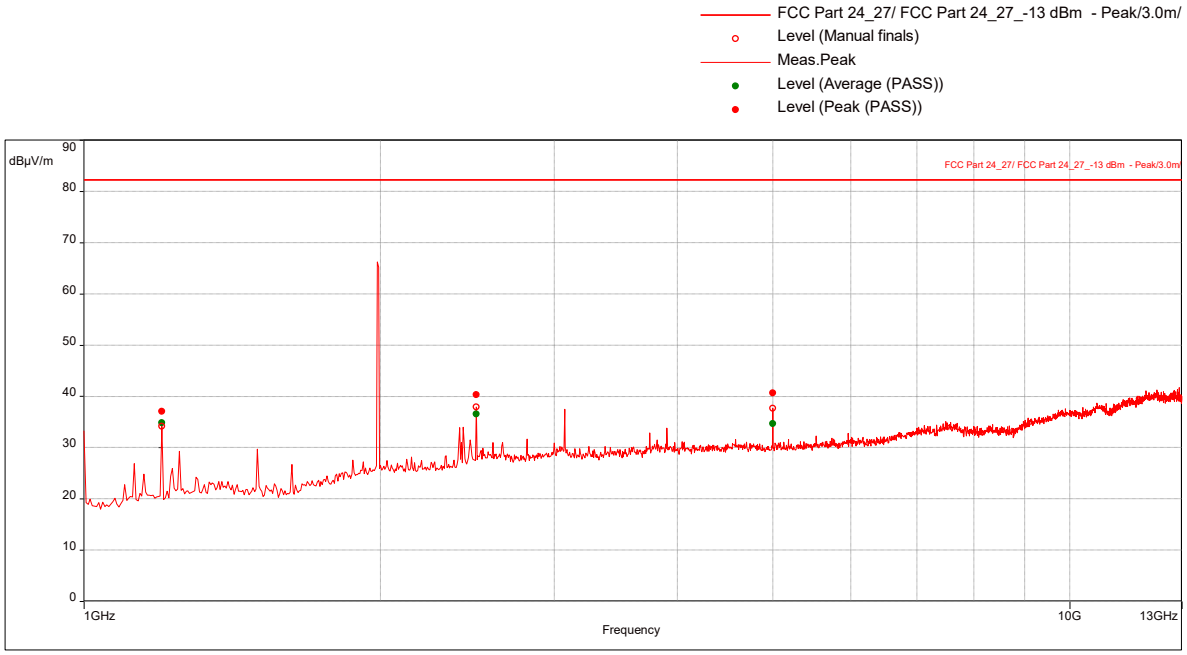
Level EIRP (dBm) = Level Peak (dBuV/m) - 84.4

Radiated Emissions, 1-22 GHz
Slot 0 (Band 2), Modulation: TM3.1-64QAM, Bandwidth 5 MHz, Transmit @ High Channel

Test Information:

Date and Time	4/30/2021 10:03:50 PM
Client and Project Number	Commscope_G104601893
Engineer	Vathana Ven
Temperature	24 deg C
Humidity	32%
Atmospheric Pressure	984 mbar
Comments	RE 1 to 13 GHz_POE_Band 2_5MHz BW_TM3.1(worst-case)_Tx High CH 1987.5MHz

Graph:



Results:

Peak (PASS) (3)

Frequency (MHz)	Level (dBµV/m)	Level (dBm)	Limit EIRP (dBµV/m)	Margin (dB)	Azimuth (°) (dB)	Height (m) (dB)	Pol. (dB)	RBW (dB)	Correction (dB)
1200	37.09	-47.31	-13.00	-34.31	0.00	2.10	Vertical	1000000.00	-21.36
2500	40.31	-44.09	-13.00	-31.09	224.00	1.01	Horizontal	1000000.00	-14.74
5000	40.60	-43.80	-13.00	-29.68	99.00	1.41	Vertical	1000000.00	-10.24

Level EIRP (dBm) = Level Peak (dBuV/m) - 84.4

Big peak was a fundamental frequency – scan from 13-22 GHz was performed manually at a close distance. No emissions were detected above the measuring equipment noise floor.

Test Personnel:	Vathana Ven VSV	Test Date:	04/29/2021 04/30/2021
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	FCC Part 24	Limit Applied:	See report section 9.3
Input Voltage:	48 VDC (POE)		
Pretest Verification w/ Ambient Signals or BB Source:	N/A	Ambient Temperature:	22, 23 ºC
		Relative Humidity:	21, 15 %
		Atmospheric Pressure:	1004, 1013 mbars

Deviations, Additions, or Exclusions: None

10 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	05/09/2021	104601893BOX-011	VFV	KPS	Original Issue
1	05/25/2021	104601893BOX-011	VFV	KPS	Removed test setup photos